



United States
Department of
Agriculture

In cooperation with
Kansas Agricultural
Experiment Station



NRCS

Natural
Resources
Conservation
Service

Soil Survey of Brown County, Kansas



How To Use This Soil Survey

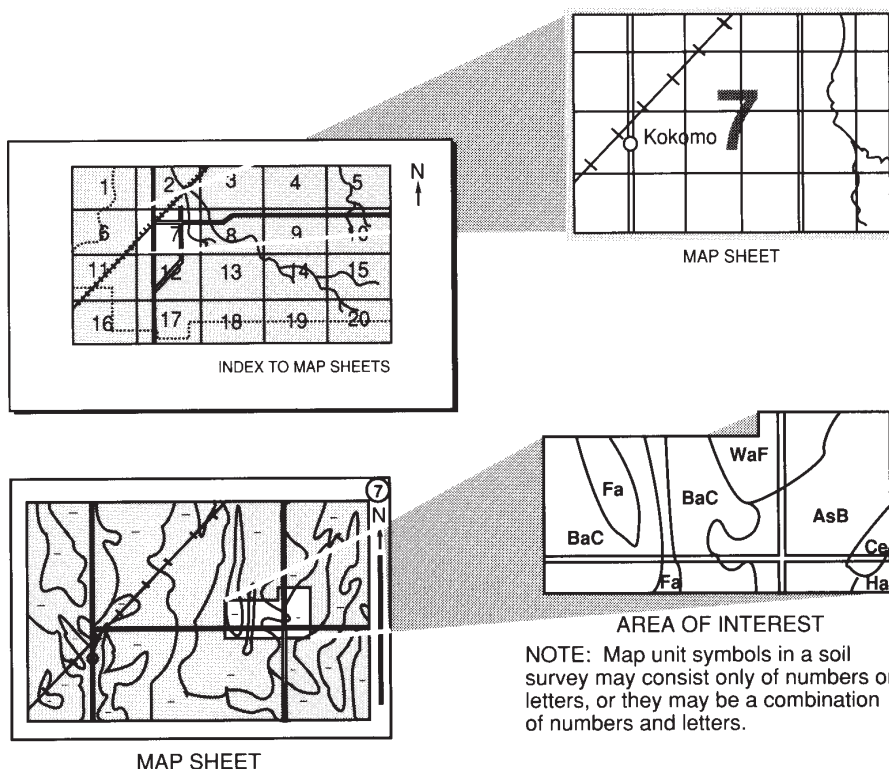
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1992. Soil names and descriptions were approved in 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service and the Kansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Brown County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

The United States Department of Agriculture (USDA) prohibits discrimination in all of its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotope, etc.) should contact the USDA's TARGET Center at 202-720-2600 (voice or TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14th and Independence Avenue SW, Washington, DC 20250-9410, or call 202-720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.

Cover: Terraces, contour farming, and a grassed waterway in an area of Aksarben soils.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at <http://www.nrcs.usda.gov>.

Contents

How To Use This Soil Survey	i
Foreword	vii
General Nature of the County	1
Climate	2
How This Survey Was Made	3
Detailed Soil Map Units	5
4350—Chase silty clay loam, rarely flooded	6
4725—Kipson-Sogn complex, 5 to 30 percent slopes	7
4832—Wamego silty clay loam, 3 to 7 percent slopes	8
4834—Wamego-Vinland silty clay loams, 3 to 15 percent slopes	9
7050—Kennebec silt loam, occasionally flooded	10
7051—Kennebec silt loam, frequently flooded	11
7060—Muscotah silt loam, overwash, occasionally flooded	12
7061—Muscotah silty clay loam, occasionally flooded	13
7091—Wabash silty clay, occasionally flooded	14
7171—Reading silt loam, moderately wet, rarely flooded	15
7205—Aksarben silty clay loam, 0 to 2 percent slopes	16
7206—Aksarben silty clay loam, 2 to 5 percent slopes	17
7207—Aksarben silty clay loam, 5 to 11 percent slopes	18
7220—Burchard clay loam, 6 to 12 percent slopes	19
7225—Burchard-Steinauer clay loams, 12 to 18 percent slopes	20
7255—Grundy silt loam, 0 to 1 percent slopes	21
7290—Marshall silt loam, 2 to 5 percent slopes	22
7293—Marshall silty clay loam, 5 to 9 percent slopes	22
7301—Martin silty clay loam, 1 to 3 percent slopes	23
7303—Martin silty clay loam, 3 to 7 percent slopes, eroded	24
7304—Martin silty clay loam, 7 to 12 percent slopes	25
7415—Mayberry clay loam, 3 to 7 percent slopes	26
7436—Morrill loam, 7 to 12 percent slopes, eroded	27
7455—Olmitz loam, 1 to 5 percent slopes	28
7470—Padonia-Martin silty clay loams, 5 to 9 percent slopes	29
7471—Padonia-Martin silty clay loams, 9 to 25 percent slopes	30
7473—Padonia-Oska silty clay loams, 5 to 9 percent slopes	31
7500—Pawnee clay loam, 1 to 3 percent slopes	33
7502—Pawnee clay loam, 3 to 7 percent slopes	34
7504—Pawnee clay loam, 7 to 12 percent slopes	34
7510—Pawnee clay, 3 to 7 percent slopes, eroded	35
7515—Pawnee clay, 7 to 12 percent slopes, eroded	36
7585—Shelby clay loam, 7 to 12 percent slopes	37
7587—Shelby clay loam, 12 to 18 percent slopes, eroded	38
7681—Wymore silty clay loam, 1 to 3 percent slopes	39
7683—Wymore silty clay loam, 3 to 6 percent slopes	40
7688—Wymore-Baileyville complex, 3 to 6 percent slopes, eroded	41
7750—Nodaway silt loam, occasionally flooded	42
7851—Judson silt loam, 1 to 5 percent slopes	43

7920—Contrary silty clay loam, 5 to 9 percent slopes	44
7965—Monona silt loam, 2 to 5 percent slopes	45
7966—Monona silt loam, 5 to 11 percent slopes, eroded	46
7981—Pohocco-Netawaka silt loams, 11 to 17 percent slopes, eroded	47
7982—Pohocco-Netawaka silt loams, 17 to 30 percent slopes	48
9971—Arents, earthen dam	49
9983—Gravel pits and quarries	49
9986—Miscellaneous water	49
9999—Water	49
Prime Farmland	51
Use and Management of the Soils	53
Interpretive Ratings	53
Rating Class Terms	53
Crops and Pasture	53
Land Capability Classification	54
Yields per Acre	55
Rangeland	55
Forestland Management and Productivity	56
Windbreaks and Environmental Plantings	59
Recreation	61
Wildlife Habitat	62
Engineering	64
Building Site Development	65
Sanitary Facilities	66
Agricultural Waste Management	68
Construction Materials	71
Water Management	72
Soil Properties	75
Engineering Index Properties	75
Physical Properties	76
Chemical Properties	78
Soil Features	79
Water Features	80
Classification of the Soils	83
Soil Series and Their Morphology	83
Aksarben Series	84
Baileyville Series	87
Burchard Series	90
Chase Series	92
Contrary Series	93
Grundy Series	95
Haig Series	96
Judson Series	98
Kennebec Series	100
Kenridge Series	102

Kipson Series	104
Marshall Series	105
Martin Series	108
Mayberry Series	109
Monona Series	112
Morrill Series	114
Muscotah Series	115
Netawaka Series	118
Nodaway Series	120
Olmitz Series	121
Oska Series	123
Otoe Series	124
Padonia Series	126
Pawnee Series	128
Pohocco Series	131
Reading Series	133
Shelby Series	134
Sogn Series	136
Steinauer Series	138
Vinland Series	139
Wabash Series	140
Wamego Series	141
Wymore Series	142
Zook Series	145
Formation of the Soils	147
Factors of Soil Formation	147
Parent Material	147
Climate	148
Plant and Animal Life	148
Relief	148
Time	148
References	151
Glossary	153
Tables	165
Table 1.—Temperature and Precipitation	166
Table 2.—Freeze Dates in Spring and Fall	167
Table 3.—Growing Season	167
Table 4.—Acreage and Proportionate Extent of the Soils	168
Table 5.—Prime Farmland	169
Table 6.—Land Capability and Yields per Acre of Crops	170
Table 7.—General Crop Production Index	173
Table 8.—Rangeland Productivity and Characteristic Plant Communities	174
Table 9.—Forestland Management and Productivity	182
Table 10.—Windbreaks and Environmental Plantings	186
Table 11.—Recreation	204

Table 12.—Wildlife Habitat	211
Table 13.—Building Site Development	215
Table 14.—Sanitary Facilities	223
Table 15.—Agricultural Waste Management	230
Table 16a.—Construction Materials	241
Table 16b.—Construction Materials	246
Table 17.—Water Management	253
Table 18.—Engineering Index Properties	259
Table 19.—Physical Properties of the Soils	270
Table 20.—Chemical Properties of the Soils	276
Table 21.—Soil Features	282
Table 22.—Water Features	285
Table 23.—Classification of the Soils	291

Issued 2005

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Harold L. Klaege
State Conservationist
Natural Resources Conservation Service

Soil Survey of Brown County, Kansas

By Cecil D. Palmer, Bruce C. Evans, and Kenneth L. Bowell, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
the Kansas Agricultural Experiment Station

General Nature of the County

BROWN COUNTY is in the northeastern part of Kansas (fig. 1). It is bordered on the north by Nebraska, on the south by Atchison and Jackson Counties, on the west by Nemaha County, and on the east by Doniphan County. It has a total land area of 366,234 acres, or about 572 square miles. In 1993, the population of the county was 11,128. Hiawatha, the county seat, is in the central part of the county along Highway 36.

The county is in two major land resource areas—the Nebraska and Kansas Loess-Drift Hills and the Iowa and Missouri Deep Loess Hills (USDA, 1981). The soils in the Nebraska and Kansas Loess-Drift Hills formed under grassland vegetation. These soils range from shallow to very deep over bedrock. The soils in the Iowa and Missouri Deep Loess Hills are in the extreme northeastern part of Brown County along the Missouri River. These soils are very deep over bedrock and formed under grassland and forest vegetation. The soils on the steep bluff near the Missouri River are light in color and support forest vegetation.

This soil survey updates the survey of Brown County, Kansas, published in 1960 (USDA, 1960). It provides additional information and has larger maps, which show the soils in greater detail.

The survey area was originally inhabited by Indians. The first European settlements were in wooded areas near streams, where logs with which to build homes were plentiful. Settlement progressed slowly; only a few pioneers had settled on Indian land

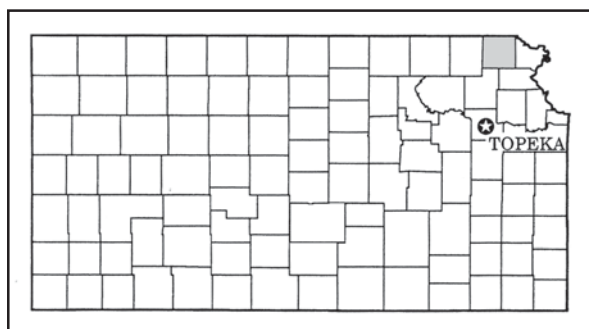


Figure 1.—Location of Brown County in Kansas.

prior to 1855. The boundaries of Brown County were established in 1855 by an act of the first legislature of the Territory of Kansas.

After the Civil War, many immigrants made homes in the county. The Missouri Pacific Railroad obtained control of 127,832 acres of the Kickapoo Indian Reservation, most of which was located in the county. An advertising campaign carried on by the railroad company induced many people to establish homes on this land.

Soil is the most important natural resource in the county. It provides a growing medium for cash crops, for grasses grazed by livestock, and for trees that provide wildlife habitat.

Ground water is the principal source of water in the county. Horton is the only city in the county that receives its water supply from surface water. Glacial drift is the principal source of ground water in the area.

Most of Brown County is in the Nebraska and Kansas Loess-Drift Hills major land resource area. The northeastern tip of the county is in the Iowa and Missouri Deep Loess Hills major land resource area. The soils in the county generally are deep or moderately deep, are nearly level to strongly sloping, and have a silty, clayey, or loamy subsoil. The highest elevation, more than 1,300 feet above sea level, is in the western part of the county west of Morrill. The lowest, about 930 feet, is along the Wolf River in the eastern part near Robinson.

Most of the eastern part of Brown County is drained by the Wolf River and its tributaries, which flow in a northern and eastern direction across the county. The northeast corner of the county is drained by Pony Creek, Walnut Creek, and Roys Creek. The Delaware River and its tributaries drain much of the southwestern portion of the county.

Many upland areas do not have adequate water for domestic and livestock use. Rural water districts distribute water to these areas. The water supply generally is better in the valleys of major streams. The source of water for livestock is from wells, local streams, or surface water impounded by dams.

Farming, ranching, and services related to these activities are some of the main enterprises in the county. About 17 percent of the county is pastureland and rangeland, 73 percent is cropland, 5 percent is woodland, and 5 percent is small water areas, farmsteads, roads, and urban and other areas. Wheat, corn, alfalfa, red clover, soybeans, and grain sorghum are the principal crops.

Climate

Tables 1, 2, and 3 give climate data as recorded at Horton, Kansas, in the period 1961 to 1990.

In winter, the average temperature is 29 degrees F and the average daily minimum temperature is 18 degrees. The lowest temperature on record, which occurred on January 4, 1947, is -30 degrees. In summer, the average temperature is 77 degrees and the average daily maximum temperature is 89 degrees. The highest recorded temperature, which occurred on August 14, 1936, is 112 degrees.

Growing degree days are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 36 inches. Of this, 26 inches, or about 72 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 13 inches. The heaviest 1-day rainfall during the period of record was 7.15 inches on October 11, 1973. Thunderstorms occur on about 56 days each year, and most occur in June.

The average seasonal snowfall is about 17.4 inches. The greatest snow depth at any one time during the period of record was 23 inches. On the average, 7 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 59 percent. Humidity is higher at night, and the average at dawn is about 82 percent. The sun shines 68 percent of the time possible in summer and 54 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in March.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit. A detailed profile description and range in characteristics for each soil are provided under the heading "Soil Series and Their Morphology."

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the

detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Aksarben silty clay loam, 2 to 5 percent slopes, is a phase of the Aksarben series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Kipson-Sogn complex, 5 to 30 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The map unit Gravel pits and quarries is an example.

In the descriptions, “LEP” means linear extensibility percent. Definitions of the ecological sites listed in the descriptions are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

4350—Chase silty clay loam, rarely flooded

Map Unit Composition

Chase: 90 percent

Minor components: 10 percent

Component Descriptions

Chase

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Flood plains in river valleys

Parent material: Silty and clayey alluvium

Slope: 0 to 2 percent

Drainage class: Somewhat poorly drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: High (about 9.9 inches)

Shrink-swell potential: Very high (about 9.2 LEP)

Flooding frequency: Rare

Depth to seasonal zone of saturation: About 22 to 26 inches

Surface runoff class: Medium

Ecological site: Loamy Lowland (pe30-37)

Land capability (nonirrigated): 2w

Typical profile:

Ap—0 to 9 inches; silty clay loam

BA—9 to 19 inches; silty clay loam

Bt—19 to 41 inches; silty clay

BC—41 to 47 inches; silty clay

C—47 to 80 inches; silty clay loam

Minor components

Kennebec

Extent: About 5 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent
Drainage class: Moderately well drained
Ecological site: Loamy Lowland (pe30-37)

Muscotah

Extent: About 5 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Ecological site: Loamy Lowland (pe30-37)

4725—Kipson-Sogn complex, 5 to 30 percent slopes

Map Unit Composition

Kipson: 60 percent
 Sogn: 30 percent
 Minor components: 10 percent

Component Descriptions

Kipson

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills
Landform: Hillslopes in the uplands
Hillslope position: Backslopes and shoulders
Parent material: Silty residuum derived from shale, calcareous
Slope: 5 to 30 percent
Depth to restrictive feature: 7 to 20 inches to bedrock (paralithic)
Drainage class: Somewhat excessively drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Low (about 3.5 inches)
Shrink-swell potential: Moderate (about 4.9 LEP)
Flooding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Very high
Ecological site: Limy Upland (pe30-37)
Land capability (nonirrigated): 6e

Typical profile:

A—0 to 8 inches; silty clay loam
 C—8 to 19 inches; silty clay loam
 Cr—19 to 22 inches; weathered bedrock

Sogn

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills
Landform: Hillslopes in the uplands
Hillslope position: Backslopes
Parent material: Loamy residuum derived from limestone
Slope: 5 to 20 percent
Depth to restrictive feature: 4 to 20 inches to bedrock (lithic)
Drainage class: Somewhat excessively drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very low (about 2.6 inches)

Shrink-swell potential: Moderate (about 4.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Very high

Ecological site: Shallow Limy (pe30-37)

Land capability (nonirrigated): 6s

Typical profile:

A—0 to 12 inches; silty clay loam

R—12 inches; weathered bedrock

Minor components

Kennebec

Extent: About 10 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

4832—Wamego silty clay loam, 3 to 7 percent slopes

Map Unit Composition

Wamego: 90 percent

Minor components: 10 percent

Component Descriptions

Wamego

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Backslopes

Parent material: Sandy and silty residuum derived from shale

Slope: 3 to 7 percent

Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)

Drainage class: Well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Low (about 4.6 inches)

Shrink-swell potential: High (about 6.4 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: High

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 9 inches; silty clay loam

Bt—9 to 20 inches; silty clay loam

BC—20 to 25 inches; silty clay loam

Cr—25 to 36 inches; weathered bedrock

Minor components

Olmitz

Extent: About 5 percent of the unit

Landform: Fan terraces in the uplands

Slope: 2 to 5 percent
Drainage class: Moderately well drained
Ecological site: Loamy Upland (pe30-37)

Pawnee

Extent: About 5 percent of the unit
Landform: Hillslopes in the uplands
Slope: 6 to 12 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe30-37)

4834—Wamego-Vinland silty clay loams, 3 to 15 percent slopes

Map Unit Composition

Wamego: 50 percent
 Vinland: 40 percent
 Minor components: 10 percent

Component Descriptions

Wamego

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Backslopes

Parent material: Sandy and silty residuum derived from shale

Slope: 3 to 15 percent

Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)

Drainage class: Well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Low (about 4.6 inches)

Shrink-swell potential: High (about 6.5 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Very high

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 6e

Typical profile:

Ap—0 to 9 inches; silty clay loam

Bt—9 to 20 inches; silty clay loam

BC—20 to 25 inches; silty clay loam

Cr—25 to 36 inches; weathered bedrock

Vinland

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Backslopes

Parent material: Sandy and silty residuum derived from shale

Slope: 3 to 15 percent

Depth to restrictive feature: 10 to 20 inches to bedrock (paralithic)

Drainage class: Somewhat excessively drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: Low (about 3.9 inches)

Shrink-swell potential: Moderate (about 4.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Very high

Ecological site: Shallow Savannah (pe30-37)

Land capability (nonirrigated): 6e

Typical profile:

A—0 to 8 inches; silty clay loam

Bw—8 to 12 inches; silty clay loam

C—12 to 19 inches; silty clay loam

Cr—19 to 23 inches; weathered bedrock

Minor components

Pawnee

Extent: About 10 percent of the unit

Landform: Hillslopes in the uplands

Slope: 6 to 12 percent

Drainage class: Moderately well drained

Ecological site: Clay Upland (pe30-37)

7050—Kennebec silt loam, occasionally flooded

Map Unit Composition

Kennebec: 89 percent

Minor components: 11 percent

Component Descriptions

Kennebec

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Flood plains in valleys

Parent material: Silty alluvium

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: Very high (about 13.2 inches)

Shrink-swell potential: Moderate (about 4.5 LEP)

Flooding frequency: Occasional

Ponding hazard: None

Depth to seasonal zone of saturation: About 39 to 45 inches

Surface runoff class: Low

Ecological site: Loamy Lowland (pe30-37)

Land capability (nonirrigated): 2w

Typical profile:

Ap—0 to 8 inches; silt loam

A1—8 to 18 inches; silt loam

A2—18 to 32 inches; silt loam

A3—32 to 41 inches; silt loam

AC—41 to 54 inches; silt loam

C—54 to 60 inches; silt loam

Minor components**Muscotah**

Extent: About 5 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Ecological site: Loamy Lowland (pe30-37)

Kenridge

Extent: About 4 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Moderately well drained
Ecological site: Loamy Lowland (pe30-37)

Zook

Extent: About 2 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Poorly drained

7051—Kennebec silt loam, frequently flooded***Map Unit Composition***

Kennebec: 85 percent
 Minor components: 15 percent

Component Descriptions**Kennebec**

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Flood plains in valleys
Parent material: Silty alluvium
Slope: 0 to 2 percent
Drainage class: Moderately well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very high (about 13.2 inches)
Shrink-swell potential: Moderate (about 3.5 LEP)
Flooding frequency: Frequent
Ponding hazard: None
Depth to seasonal zone of saturation: About 39 to 55 inches
Surface runoff class: Low
Ecological site: Loamy Lowland (pe30-37)
Land capability (nonirrigated): 5w

Typical profile:

Ap—0 to 8 inches; silt loam
 A1—8 to 18 inches; silt loam
 A2—18 to 32 inches; silt loam
 A3—32 to 41 inches; silt loam
 AC—41 to 54 inches; silt loam
 C—54 to 60 inches; silt loam

Minor components

Nodaway

Phase: Frequently flooded
Extent: About 8 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Moderately well drained
Ecological site: Loamy Lowland (pe30-37)

Kenridge

Phase: Frequently flooded
Extent: About 3 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Moderately well drained
Ecological site: Loamy Lowland (pe30-37)

Muscotah

Phase: Occasionally flooded
Extent: About 3 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Ecological site: Loamy Lowland (pe30-37)

Zook

Phase: Occasionally flooded
Extent: About 1 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Poorly drained

7060—Muscotah silt loam, overwash, occasionally flooded

Map Unit Composition

Muscotah: 87 percent
 Minor components: 13 percent

Component Descriptions

Muscotah

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Flood plains in valleys
Parent material: Clayey alluvium
Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Slowest permeability: Impermeable
Available water capacity: High (about 11.2 inches)
Shrink-swell potential: High (about 7.5 LEP)
Flooding frequency: Occasional
Depth to seasonal zone of saturation: About 21 to 26 inches
Surface runoff class: Medium

Ecological site: Loamy Lowland (pe30-37)

Land capability (nonirrigated): 2w

Typical profile:

Ap—0 to 9 inches; silt loam
 C—9 to 16 inches; stratified silt loam to silty clay loam
 Ab—16 to 30 inches; silty clay loam
 Bwb—30 to 39 inches; silty clay
 Bgb1—39 to 61 inches; silty clay
 Bgb2—61 to 70 inches; silty clay
 Bgb3—70 to 80 inches; silty clay

Minor components

Kennebec

Extent: About 5 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Moderately well drained
Ecological site: Loamy Lowland (pe30-37)

Zook

Extent: About 5 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Poorly drained

Chase

Extent: About 3 percent of the unit
Landform: Flood plains in river valleys
Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Ecological site: Loamy Lowland (pe30-37)

7061—Muscotah silty clay loam, occasionally flooded

Map Unit Composition

Muscotah: 87 percent

Minor components: 13 percent

Component Descriptions

Muscotah

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Flood plains in valleys

Parent material: Clayey alluvium

Slope: 0 to 2 percent

Drainage class: Somewhat poorly drained

Slowest permeability: Impermeable

Available water capacity: High (about 10.8 inches)

Shrink-swell potential: High (about 7.5 LEP)

Flooding frequency: Occasional

Depth to seasonal zone of saturation: About 21 to 26 inches

Surface runoff class: Medium

Ecological site: Loamy Lowland (pe30-37)

Land capability (nonirrigated): 2w

Typical profile:

Ap—0 to 9 inches; silty clay loam
 A1—9 to 16 inches; silty clay loam
 A2—16 to 23 inches; silty clay loam
 Bw1—23 to 35 inches; silty clay
 Bw2—35 to 44 inches; silty clay
 Bw3—44 to 60 inches; silty clay
 Bw4—60 to 70 inches; silty clay
 Bg—70 to 80 inches; silty clay

Minor components

Kennebec

Extent: About 5 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

Wabash

Extent: About 5 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Poorly drained

Chase

Extent: About 3 percent of the unit

Landform: Flood plains in river valleys

Slope: 0 to 2 percent

Drainage class: Somewhat poorly drained

Ecological site: Loamy Lowland (pe30-37)

7091—Wabash silty clay, occasionally flooded

Map Unit Composition

Wabash: 85 percent

Minor components: 15 percent

Component Descriptions

Wabash

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Flood plains in valleys

Parent material: Clayey alluvium

Slope: 0 to 2 percent

Drainage class: Poorly drained

Slowest permeability: Very slow

Available water capacity: Moderate (about 6.4 inches)

Shrink-swell potential: Very high (about 10.4 LEP)

Flooding frequency: Occasional

Depth to seasonal zone of saturation: About 2 to 9 inches

Surface runoff class: High

Ecological site: Clay Lowland (pe30-37)

Land capability (nonirrigated): 3w

Typical profile:

Ap—0 to 7 inches; silty clay

A—7 to 15 inches; silty clay

Bg—15 to 80 inches; silty clay

Minor components

Muscotah

Extent: About 12 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Somewhat poorly drained

Ecological site: Loamy Lowland (pe30-37)

Kennebec

Extent: About 3 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

7171—Reading silt loam, moderately wet, rarely flooded

Map Unit Composition

Reading: 90 percent

Minor components: 10 percent

Component Descriptions

Reading

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Flood plains in valleys

Parent material: Silty alluvium

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Slowest permeability: Moderately slow (about 0.20 inch per hour)

Available water capacity: High (about 11.8 inches)

Shrink-swell potential: Moderate (about 4.9 LEP)

Flooding frequency: Rare

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Medium

Ecological site: Loamy Lowland (pe30-37)

Land capability (nonirrigated): 1

Typical profile:

Ap—0 to 9 inches; silt loam

A—9 to 18 inches; silt loam

Bt—18 to 48 inches; silty clay loam

BC—48 to 54 inches; silty clay loam

C—54 to 80 inches; silty clay loam

Minor components**Chase**

Extent: About 5 percent of the unit
Landform: Flood plains in river valleys
Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Ecological site: Loamy Lowland (pe30-37)

Zook

Extent: About 5 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Poorly drained

7205—Aksarben silty clay loam, 0 to 2 percent slopes***Map Unit Composition***

Aksarben: 90 percent
 Minor components: 10 percent

Component Descriptions**Aksarben**

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills
Landform: Divides in the uplands
Hillslope position: Summits
Parent material: Loess
Slope: 0 to 2 percent
Drainage class: Well drained
Slowest permeability: Moderately slow (about 0.20 inch per hour)
Available water capacity: High (about 10.6 inches)
Shrink-swell potential: High (about 7.7 LEP)
Flooding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Medium
Ecological site: Loamy Upland (pe30-37)
Land capability (nonirrigated): 1

Typical profile:

Ap—0 to 9 inches; silty clay loam
 A—9 to 13 inches; silty clay loam
 BA—13 to 19 inches; silty clay loam
 Bt—19 to 39 inches; silty clay loam
 BC—39 to 47 inches; silty clay loam
 C—47 to 80 inches; silt loam

Minor components**Marshall**

Extent: About 10 percent of the unit
Landform: Interfluvies in the uplands
Slope: 2 to 5 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-37)

7206—Aksarben silty clay loam, 2 to 5 percent slopes***Map Unit Composition***

Aksarben: 87 percent

Minor components: 13 percent

Component Descriptions**Aksarben**

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Interfluves in the uplands

Parent material: Loess

Slope: 2 to 5 percent

Drainage class: Well drained

Slowest permeability: Moderately slow (about 0.20 inch per hour)

Available water capacity: High (about 10.7 inches)

Shrink-swell potential: High (about 7.4 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Medium

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 2e

Typical profile:

Ap—0 to 6 inches; silty clay loam

A—6 to 12 inches; silty clay loam

Bt—12 to 42 inches; silty clay loam

BC—42 to 60 inches; silty clay loam

C—60 to 80 inches; silty clay loam

Minor components**Marshall**

Extent: About 4 percent of the unit

Landform: Interfluves in the uplands

Slope: 2 to 5 percent

Drainage class: Well drained

Ecological site: Loamy Upland (pe30-37)

Wymore

Extent: About 4 percent of the unit

Landform: Interfluves in the uplands

Slope: 2 to 5 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

Kennebec

Extent: About 3 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

Judson

Extent: About 2 percent of the unit

Landform: Fan remnants in the uplands

Slope: 2 to 6 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-37)

7207—Aksarben silty clay loam, 5 to 11 percent slopes

Map Unit Composition

Aksarben: 85 percent
 Minor components: 15 percent

Component Descriptions

Aksarben

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Parent material: Loess

Slope: 5 to 11 percent

Drainage class: Well drained

Slowest permeability: Moderately slow (about 0.20 inch per hour)

Available water capacity: High (about 10.7 inches)

Shrink-swell potential: High (about 7.4 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: High

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 6 inches; silty clay loam

A—6 to 10 inches; silty clay loam

Bt—10 to 40 inches; silty clay loam

BC—40 to 60 inches; silty clay loam

C—60 to 80 inches; silty clay loam

Minor components

Judson

Extent: About 3 percent of the unit

Landform: Fan remnants in the uplands

Slope: 2 to 6 percent

Drainage class: Well drained

Ecological site: Loamy Lowland (pe30-37)

Kennebec

Extent: About 3 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

Marshall

Extent: About 3 percent of the unit

Landform: Hillslopes in the uplands

Slope: 5 to 11 percent

Drainage class: Well drained

Ecological site: Loamy Upland (pe30-37)

Morrill

Extent: About 3 percent of the unit
Landform: Hillslopes in the uplands
Slope: 6 to 12 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-37)

Wymore

Extent: About 3 percent of the unit
Landform: Hillslopes in the uplands
Slope: 5 to 9 percent
Drainage class: Moderately well drained
Ecological site: Loamy Lowland (pe30-37)

7220—Burchard clay loam, 6 to 12 percent slopes***Map Unit Composition***

Burchard: 85 percent
 Minor components: 15 percent

Component Descriptions**Burchard**

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills
Landform: Hillslopes in the uplands
Hillslope position: Backslopes
Parent material: Loamy till
Slope: 6 to 12 percent
Drainage class: Well drained
Slowest permeability: Moderately slow (about 0.20 inch per hour)
Available water capacity: High (about 9.5 inches)
Shrink-swell potential: Moderate (about 5.6 LEP)
Flooding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: High
Ecological site: Loamy Upland (pe30-37)
Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 9 inches; clay loam
 A—9 to 13 inches; clay loam
 Bt—13 to 19 inches; clay loam
 Btk—19 to 29 inches; clay loam
 BCk—29 to 37 inches; clay loam
 C—37 to 60 inches; loam

Minor components**Pawnee**

Extent: About 10 percent of the unit
Landform: Hillslopes in the uplands
Slope: 6 to 12 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe30-37)

Steinauer*Extent:* About 5 percent of the unit*Landform:* Hillslopes in the uplands*Slope:* 6 to 12 percent*Drainage class:* Well drained*Ecological site:* Limy Upland (pe30-37)**7225—Burchard-Steinauer clay loams, 12 to 18 percent slopes*****Map Unit Composition***

Burchard: 55 percent

Steinauer: 40 percent

Minor components: 5 percent

Component Descriptions**Burchard***MLRA:* 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills*Landform:* Hillslopes in the uplands*Hillslope position:* Backslopes*Parent material:* Loamy till*Slope:* 12 to 18 percent*Drainage class:* Well drained*Slowest permeability:* Moderately slow (about 0.20 inch per hour)*Available water capacity:* High (about 9.4 inches)*Shrink-swell potential:* Moderate (about 5.6 LEP)*Flooding hazard:* None*Depth to seasonal zone of saturation:* More than 6 feet*Surface runoff class:* High*Ecological site:* Loamy Upland (pe30-37)*Land capability (nonirrigated):* 6e*Typical profile:*

Ap—0 to 9 inches; clay loam

Bt—9 to 19 inches; clay loam

Btk—19 to 29 inches; clay loam

BCk—29 to 37 inches; clay loam

C—37 to 60 inches; clay loam

Steinauer*MLRA:* 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills*Landform:* Hillslopes in the uplands*Hillslope position:* Backslopes*Parent material:* Fine-loamy till*Slope:* 12 to 18 percent*Drainage class:* Well drained*Slowest permeability:* Moderately slow (about 0.20 inch per hour)*Available water capacity:* High (about 10.8 inches)*Shrink-swell potential:* Moderate (about 4.9 LEP)*Flooding hazard:* None*Depth to seasonal zone of saturation:* More than 6 feet

Surface runoff class: High
Ecological site: Limy Upland (pe30-37)
Land capability (nonirrigated): 6e

Typical profile:

A—0 to 6 inches; clay loam
 AC—6 to 14 inches; clay loam
 C—14 to 80 inches; clay loam

Minor components

Padonia

Extent: About 5 percent of the unit
Landform: Hillslopes in the uplands
Slope: 9 to 25 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Clay Upland (pe30-37)

7255—Grundy silt loam, 0 to 1 percent slopes

Map Unit Composition

Grundy: 90 percent
 Minor components: 10 percent

Component Descriptions

Grundy

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Divides in the uplands
Hillslope position: Shoulders and summits
Parent material: Loess
Slope: 0 to 1 percent
Drainage class: Somewhat poorly drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: High (about 9.3 inches)
Shrink-swell potential: Very high (about 9.2 LEP)
Flooding hazard: None
Depth to seasonal zone of saturation: About 12 to 17 inches
Surface runoff class: High
Ecological site: Clay Upland (pe30-37)
Land capability (nonirrigated): 2w

Typical profile:

Ap—0 to 7 inches; silt loam
 A—7 to 14 inches; silty clay loam
 Bt—14 to 41 inches; silty clay
 BC—41 to 48 inches; silty clay loam
 C—48 to 80 inches; silty clay loam

Minor components

Haig

Extent: About 10 percent of the unit
Landform: Divides in the uplands
Slope: 0 to 2 percent

Drainage class: Poorly drained

Ecological site: Clay Upland (pe30-37)

7290—Marshall silt loam, 2 to 5 percent slopes

Map Unit Composition

Marshall: 97 percent

Minor components: 3 percent

Component Descriptions

Marshall

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Uplands on interfluves

Hillslope position: Summits and shoulders

Parent material: Loamy loess

Slope: 2 to 5 percent

Drainage class: Well drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: Very high (about 12.8 inches)

Shrink-swell potential: Moderate (about 4.7 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Low

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 2e

Typical profile:

Ap—0 to 10 inches; silt loam

BA—10 to 13 inches; silty clay loam

Bw—13 to 32 inches; silty clay loam

C—32 to 80 inches; silt loam

Minor components

Aksarben

Extent: About 3 percent of the unit

Landform: Interfluves in the uplands

Slope: 2 to 5 percent

Drainage class: Well drained

Ecological site: Loamy Upland (pe30-37)

7293—Marshall silty clay loam, 5 to 9 percent slopes

Map Unit Composition

Marshall: 82 percent

Minor components: 18 percent

Component Descriptions

Marshall

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Parent material: Loamy loess

Slope: 5 to 9 percent

Drainage class: Well drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: High (about 12.8 inches)

Shrink-swell potential: Moderate (about 4.7 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Medium

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 10 inches; silt loam

BA—10 to 13 inches; silty clay loam

Bw—13 to 32 inches; silty clay loam

C—32 to 80 inches; silt loam

Minor components

Contrary

Extent: About 7 percent of the unit

Landform: Hillslopes in the uplands

Slope: 5 to 9 percent

Drainage class: Well drained

Ecological site: Loamy Upland (pe30-37)

Morrill

Extent: About 5 percent of the unit

Landform: Hillslopes in the uplands

Slope: 6 to 12 percent

Drainage class: Well drained

Ecological site: Loamy Lowland (pe30-37)

Judson

Extent: About 3 percent of the unit

Landform: Fan remnants in the uplands

Slope: 2 to 6 percent

Drainage class: Well drained

Ecological site: Loamy Lowland (pe30-37)

Kennebec

Extent: About 3 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

7301—Martin silty clay loam, 1 to 3 percent slopes

Map Unit Composition

Martin: 85 percent

Minor components: 15 percent

Component Descriptions

Martin

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Footslopes

Parent material: Silty and clayey colluvium derived from limestone-shale over silty and clayey residuum derived from limestone-shale

Slope: 1 to 4 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: High (about 9.5 inches)

Shrink-swell potential: Very high (about 9.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 22 to 26 inches

Surface runoff class: High

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 2e

Typical profile:

Ap—0 to 6 inches; silty clay loam

BA—6 to 12 inches; silty clay loam

Bt—12 to 53 inches; silty clay

C—53 to 80 inches; silty clay

Minor components

Chase

Extent: About 10 percent of the unit

Landform: Flood plains in river valleys

Slope: 0 to 2 percent

Drainage class: Somewhat poorly drained

Ecological site: Loamy Lowland (pe30-37)

Pawnee

Extent: About 5 percent of the unit

Landform: Hillslopes in the uplands

Slope: 2 to 6 percent

Drainage class: Moderately well drained

Ecological site: Clay Upland (pe30-37)

7303—Martin silty clay loam, 3 to 7 percent slopes, eroded

Map Unit Composition

Martin: 90 percent

Minor components: 10 percent

Component Descriptions

Martin

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Footslopes and backslopes

Parent material: Silty and clayey colluvium derived from limestone-shale over silty and clayey residuum derived from limestone-shale

Slope: 3 to 7 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: High (about 9.5 inches)

Shrink-swell potential: Very high (about 9.7 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 22 to 26 inches

Surface runoff class: Very high

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 6 inches; silty clay loam

BA—6 to 12 inches; silty clay loam

Bt—12 to 53 inches; silty clay

C—53 to 80 inches; silty clay loam

Minor components

Padonia

Extent: About 5 percent of the unit

Landform: Hillslopes in the uplands

Slope: 5 to 9 percent

Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)

Drainage class: Well drained

Ecological site: Clay Upland (pe30-37)

Vinland

Extent: About 5 percent of the unit

Landform: Hillslopes in the uplands

Slope: 3 to 15 percent

Depth to restrictive feature: 10 to 20 inches to bedrock (paralithic)

Drainage class: Somewhat excessively drained

Ecological site: Shallow Savannah (pe30-37)

7304—Martin silty clay loam, 7 to 12 percent slopes

Map Unit Composition

Martin: 90 percent

Minor components: 10 percent

Component Descriptions

Martin

MLRA: 106 - Nebraska and Kansas Loess-Drift Hills, 107 - Iowa and Missouri Deep Loess Hills

Landform: Hillslope on upland

Hillslope position: Footslope, backslope

Parent material: Silty and clayey colluvium derived from limestone-shale over silty and clayey residuum derived from limestone-shale

Slope: 7 to 12 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inches per hour)
Available water capacity: High (about 10.2 inches)
Shrink-swell potential: Very high (about 9.7 LEP)
Flooding hazard: None
Depth to seasonal zone of saturation: About 22 to 26 inches
Surface runoff class: Very high
Ecological site: Loamy Upland (pe30-37)
Land capability (nonirrigated): 4e

Typical Profile:

Ap—0 to 6 inches; silty clay loam
 A—6 to 14 inches; silty clay loam
 BA—14 to 24 inches; silty clay loam
 Bt—24 to 53 inches; silty clay
 C—53 to 80 inches; silty clay loam

Minor Components

Padonia

Extent: About 5 percent of the unit
Landform: Hillslopes on the uplands
Slope: 5 to 9 percent
Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)
Drainage class: Well drained
Ecological site: Clay Upland (pe30-37)

Vinland

Extent: About 5 percent of the unit
Landform: Hillslopes on the uplands
Slope: 3 to 15 percent
Depth to restrictive feature: 10 to 20 inches to bedrock (paralithic)
Drainage class: Somewhat excessively drained
Ecological site: Shallow Savannah (pe30-37)

7415—Mayberry clay loam, 3 to 7 percent slopes

Map Unit Composition

Mayberry: 85 percent
 Minor components: 15 percent

Component Descriptions

Mayberry

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills
Landform: Hillslopes in the uplands
Hillslope position: Backslopes
Parent material: Till
Slope: 3 to 7 percent
Drainage class: Moderately well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: Moderate (about 7.7 inches)
Shrink-swell potential: Very high (about 9.2 LEP)
Flooding hazard: None

Depth to seasonal zone of saturation: About 9 to 14 inches

Surface runoff class: High

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 10 inches; clay loam

Bt—10 to 42 inches; clay

C—42 to 80 inches; clay loam

Minor components

Morrill

Extent: About 8 percent of the unit

Landform: Hillslopes in the uplands

Slope: 6 to 12 percent

Drainage class: Well drained

Ecological site: Loamy Lowland (pe30-37)

Wymore

Extent: About 7 percent of the unit

Landform: Interfluvies in the uplands

Slope: 2 to 5 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

7436—Morrill loam, 7 to 12 percent slopes, eroded

Map Unit Composition

Morrill: 87 percent

Minor components: 13 percent

Component Descriptions

Morrill

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Parent material: Glacial drifts

Slope: 7 to 12 percent

Drainage class: Well drained

Slowest permeability: Moderately slow (about 0.20 inch per hour)

Available water capacity: High (about 9.2 inches)

Shrink-swell potential: Moderate (about 4.7 LEP)

Flooding hazard: None

Ponding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: High

Ecological site: Loamy Lowland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 6 inches; loam

BA—6 to 12 inches; loam

Bt1—12 to 22 inches; loam

Bt2—22 to 43 inches; sandy clay loam

C—43 to 80 inches; stratified fine sandy loam to loamy fine sand to sand

Minor components

Kennebec

Extent: About 5 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

Pawnee

Extent: About 5 percent of the unit

Landform: Hillslopes in the uplands

Slope: 6 to 12 percent

Drainage class: Moderately well drained

Ecological site: Clay Upland (pe30-37)

Olmitz

Extent: About 3 percent of the unit

Landform: Fan terraces in the uplands

Slope: 2 to 5 percent

Drainage class: Moderately well drained

Ecological site: Loamy Upland (pe30-37)

7455—Olmitz loam, 1 to 5 percent slopes

Map Unit Composition

Olmitz: 93 percent

Minor components: 7 percent

Component Descriptions

Olmitz

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Fan terraces in the uplands

Hillslope position: Footslopes

Parent material: Fine-loamy alluvium

Slope: 1 to 5 percent

Drainage class: Moderately well drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: High (about 10.3 inches)

Shrink-swell potential: Moderate (about 4.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 40 to 44 inches

Surface runoff class: Low

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 2e

Typical profile:

Ap—0 to 7 inches; loam

A—7 to 20 inches; loam

Bw—20 to 42 inches; clay loam

BC—42 to 80 inches; clay loam

Minor components**Chase**

Extent: About 4 percent of the unit
Landform: Flood plains in river valleys
Slope: 0 to 2 percent
Drainage class: Somewhat poorly drained
Ecological site: Loamy Lowland (pe30-37)

Pawnee

Extent: About 3 percent of the unit
Landform: Hillslopes in the uplands
Slope: 2 to 6 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe30-37)

7470—Padonia-Martin silty clay loams, 5 to 9 percent slopes

Map Unit Composition

Padonia: 50 percent
 Martin: 40 percent
 Minor components: 10 percent

Component Descriptions**Padonia**

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Backslopes

Parent material: Residuum derived from shale, calcareous

Slope: 5 to 9 percent

Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)

Drainage class: Well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Moderate (about 6.5 inches)

Shrink-swell potential: High (about 7.5 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: High

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

A—0 to 11 inches; silty clay loam
 Bt—11 to 22 inches; silty clay
 Btk—22 to 32 inches; silty clay
 BCk—32 to 37 inches; silty clay loam
 Cr—37 to 40 inches; weathered bedrock

Martin

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Footslopes and backslopes

Parent material: Silty and clayey colluvium derived from limestone-shale over silty and clayey residuum derived from limestone-shale

Slope: 4 to 12 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: High (about 9.5 inches)

Shrink-swell potential: Very high (about 9.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 22 to 26 inches

Surface runoff class: Very high

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 6 inches; silty clay loam

BA—6 to 12 inches; silty clay loam

Bt—12 to 53 inches; silty clay

C—53 to 80 inches; silty clay

Minor components

Kipson

Extent: About 10 percent of the unit

Landform: Hillslopes in the uplands

Slope: 5 to 30 percent

Depth to restrictive feature: 7 to 20 inches to bedrock (paralithic)

Drainage class: Somewhat excessively drained

Ecological site: Limy Upland (pe30-37)

7471—Padonia-Martin silty clay loams, 9 to 25 percent slopes

Map Unit Composition

Padonia: 60 percent

Martin: 30 percent

Minor components: 10 percent

Component Descriptions

Padonia

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Footslopes and backslopes

Parent material: Residuum derived from shale, calcareous

Slope: 9 to 25 percent

Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)

Drainage class: Well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Moderate (about 6.5 inches)

Shrink-swell potential: High (about 7.5 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Very high

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 6e

Typical profile:

A—0 to 11 inches; silty clay loam

Bt—11 to 22 inches; silty clay

Btk—22 to 32 inches; silty clay

BC—32 to 37 inches; silty clay loam

Cr—37 to 41 inches; weathered bedrock

Martin

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Footslopes and backslopes

Parent material: Silty and clayey colluvium derived from limestone-shale over silty and clayey residuum derived from limestone-shale

Slope: 4 to 12 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: High (about 9.5 inches)

Shrink-swell potential: Very high (about 9.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: about 22 to 26 inches

Surface runoff class: Very high

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 6 inches; silty clay loam

BA—6 to 12 inches; silty clay loam

Bt—12 to 53 inches; silty clay

C—53 to 80 inches; silty clay

Minor components

Kipson

Extent: About 10 percent of the unit

Landform: Hillslopes in the uplands

Slope: 5 to 30 percent

Depth to restrictive feature: 7 to 20 inches to bedrock (paralithic)

Drainage class: Somewhat excessively drained

Ecological site: Limy Upland (pe30-37)

7473—Padonia-Oska silty clay loams, 5 to 9 percent slopes

Map Unit Composition

Padonia: 55 percent

Oska: 40 percent

Minor components: 5 percent

Component Descriptions

Padonia

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Shoulders

Parent material: Residuum derived from shale, calcareous

Slope: 5 to 9 percent

Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)

Drainage class: Well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Moderate (about 6.5 inches)

Shrink-swell potential: High (about 7.5 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: High

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

A—0 to 11 inches; silty clay loam

Bt—11 to 22 inches; silty clay

Btk—22 to 32 inches; silty clay

BCk—32 to 37 inches; silty clay loam

Cr—37 to 40 inches; weathered bedrock

Oska

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Backslopes

Parent material: Silty and clayey residuum derived from limestone-shale

Slope: 5 to 9 percent

Depth to restrictive feature: 20 to 40 inches to bedrock (lithic)

Drainage class: Well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Low (about 5.8 inches)

Shrink-swell potential: High (about 8.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Very high

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 5 inches; silty clay loam

BA—5 to 11 inches; silty clay loam

Bt—11 to 35 inches; silty clay

R—35 to 39 inches; unweathered bedrock

Minor components

Kipson

Extent: About 5 percent of the unit

Landform: Hillslopes in the uplands
Slope: 5 to 30 percent
Depth to restrictive feature: 7 to 20 inches to bedrock (paralithic)
Drainage class: Somewhat excessively drained
Ecological site: Limy Upland (pe30-37)

7500—Pawnee clay loam, 1 to 3 percent slopes

Map Unit Composition

Pawnee: 90 percent
 Minor components: 10 percent

Component Descriptions

Pawnee

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands
Hillslope position: Backslopes
Parent material: Clayey drift
Slope: 1 to 3 percent
Drainage class: Moderately well drained
Slowest permeability: Slow (about 0.06 inch per hour)
Available water capacity: Moderate (about 7.5 inches)
Shrink-swell potential: High (about 7.9 LEP)
Flooding hazard: None
Depth to seasonal zone of saturation: About 12 to 36 inches
Surface runoff class: High
Ecological site: Loamy Upland (pe30-37)
Land capability (nonirrigated): 2e

Typical profile:

Ap—0 to 8 inches; clay loam
 BA—8 to 15 inches; clay loam
 Bt—15 to 41 inches; clay
 BC—41 to 51 inches; clay
 C—51 to 60 inches; clay loam

Minor components

Burchard

Extent: About 5 percent of the unit
Landform: Hillslopes in the uplands
Slope: 5 to 11 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-37)

Morrill

Extent: About 5 percent of the unit
Landform: Hillslopes in the uplands
Slope: 4 to 8 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-37)

7502—Pawnee clay loam, 3 to 7 percent slopes

Map Unit Composition

Pawnee: 85 percent

Minor components: 15 percent

Component Descriptions

Pawnee

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep

Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Shoulders and summits

Parent material: Till

Slope: 3 to 7 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Moderate (about 7.4 inches)

Shrink-swell potential: Very high (about 9.2 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 12 to 17 inches

Surface runoff class: High

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 7 inches; clay loam

BA—7 to 12 inches; clay loam

Bt—12 to 48 inches; clay

C—48 to 80 inches; clay loam

Minor components

Morrill

Extent: About 8 percent of the unit

Landform: Hillslopes in the uplands

Slope: 6 to 12 percent

Drainage class: Well drained

Ecological site: Loamy Lowland (pe30-37)

Shelby

Extent: About 7 percent of the unit

Landform: Hillslopes in the uplands

Slope: 6 to 12 percent

Drainage class: Well drained

Ecological site: Loamy Upland (pe30-37)

7504—Pawnee clay loam, 7 to 12 percent slopes

Map Unit Composition

Pawnee: 85 percent

Minor components: 15 percent

Component Descriptions

Pawnee

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Shoulders and summits

Parent material: Till

Slope: 7 to 12 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Moderate (about 7.4 inches)

Shrink-swell potential: Very high (about 9.2 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 12 to 17 inches

Surface runoff class: Very high

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 7 inches; clay loam

BA—7 to 12 inches; clay loam

Bt—12 to 48 inches; clay

C—48 to 80 inches; clay loam

Minor components

Morrill

Extent: About 7 percent of the unit

Landform: Hillslopes in the uplands

Slope: 6 to 12 percent

Drainage class: Well drained

Ecological site: Loamy Lowland (pe30-37)

Kennebec

Extent: About 5 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

Olmitz

Extent: About 3 percent of the unit

Landform: Fan terraces in the uplands

Slope: 2 to 5 percent

Drainage class: Moderately well drained

Ecological site: Loamy Upland (pe30-37)

7510—Pawnee clay, 3 to 7 percent slopes, eroded

Map Unit Composition

Pawnee: 85 percent

Minor components: 15 percent

Component Descriptions

Pawnee

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Backslopes

Parent material: Clayey drift

Slope: 3 to 7 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Moderate (about 6.8 inches)

Shrink-swell potential: High (about 7.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 12 to 36 inches

Surface runoff class: Very high

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 6 inches; clay

Bt—6 to 39 inches; clay

BC—39 to 51 inches; clay

C—51 to 60 inches; clay loam

Minor components

Burchard

Extent: About 8 percent of the unit

Landform: Hillslopes in the uplands

Slope: 5 to 11 percent

Drainage class: Well drained

Ecological site: Loamy Upland (pe30-37)

Kipson

Extent: About 7 percent of the unit

Landform: Hillslopes in the uplands

Slope: 5 to 25 percent

Depth to restrictive feature: 7 to 20 inches to bedrock (paralithic)

Drainage class: Somewhat excessively drained

Ecological site: Limy Upland (pe30-37)

7515—Pawnee clay, 7 to 12 percent slopes, eroded

Map Unit Composition

Pawnee: 84 percent

Minor components: 16 percent

Component Descriptions

Pawnee

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Backslopes

Parent material: Till

Slope: 7 to 12 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Moderate (about 6.6 inches)

Shrink-swell potential: Very high (about 9.2 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 12 to 17 inches

Surface runoff class: Very high

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 5 inches; clay

Bt—5 to 45 inches; clay

C—45 to 80 inches; clay loam

Minor components

Mayberry

Extent: About 7 percent of the unit

Landform: Hillslopes in the uplands

Slope: 2 to 6 percent

Drainage class: Moderately well drained

Ecological site: Clay Upland (pe30-37)

Kennebec

Extent: About 6 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

Olmitz

Extent: About 3 percent of the unit

Landform: Fan terraces in the uplands

Slope: 2 to 5 percent

Drainage class: Moderately well drained

Ecological site: Loamy Upland (pe30-37)

7585—Shelby clay loam, 7 to 12 percent slopes

Map Unit Composition

Shelby: 88 percent

Minor components: 12 percent

Component Descriptions

Shelby

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Backslopes and shoulders

Parent material: Till
Slope: 7 to 12 percent
Drainage class: Well drained
Slowest permeability: Moderately slow (about 0.20 inch per hour)
Available water capacity: High (about 10.2 inches)
Shrink-swell potential: Moderate (about 4.5 LEP)
Flooding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: High
Ecological site: Loamy Upland (pe30-37)
Land capability (nonirrigated): 3e

Typical profile:

A—0 to 13 inches; clay loam
 Bt—13 to 36 inches; clay loam
 BC—36 to 48 inches; clay loam
 C—48 to 80 inches; clay loam

Minor components

Pawnee

Extent: About 5 percent of the unit
Landform: Hillslopes in the uplands
Slope: 6 to 12 percent
Drainage class: Moderately well drained
Ecological site: Clay Upland (pe30-37)

Kennebec

Extent: About 4 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Moderately well drained
Ecological site: Loamy Lowland (pe30-37)

Olmitz

Extent: About 3 percent of the unit
Landform: Fan terraces in the uplands
Slope: 2 to 5 percent
Drainage class: Moderately well drained
Ecological site: Loamy Upland (pe30-37)

7587—Shelby clay loam, 12 to 18 percent slopes, eroded

Map Unit Composition

Shelby: 85 percent
 Minor components: 15 percent

Component Descriptions

Shelby

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills
Landform: Hillslopes in the uplands

Hillslope position: Shoulders and backslopes

Parent material: Till

Slope: 12 to 18 percent

Drainage class: Well drained

Slowest permeability: Moderately slow (about 0.20 inch per hour)

Available water capacity: High (about 12.1 inches)

Shrink-swell potential: Moderate (about 5.6 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: High

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 8 inches; clay loam

Bt—8 to 36 inches; clay loam

BC—36 to 48 inches; clay loam

C—48 to 80 inches; clay loam

Minor components

Pawnee

Extent: About 5 percent of the unit

Landform: Hillslopes in the uplands

Slope: 6 to 12 percent

Drainage class: Moderately well drained

Ecological site: Clay Upland (pe30-37)

Padonia

Extent: About 4 percent of the unit

Landform: Hillslopes in the uplands

Slope: 9 to 25 percent

Depth to restrictive feature: 20 to 40 inches to bedrock (paralithic)

Drainage class: Well drained

Ecological site: Clay Upland (pe30-37)

Kennebec

Extent: About 3 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

Olmitz

Extent: About 3 percent of the unit

Landform: Fan terraces in the uplands

Slope: 2 to 5 percent

Drainage class: Moderately well drained

Ecological site: Loamy Upland (pe30-37)

7681—Wymore silty clay loam, 1 to 3 percent slopes

Map Unit Composition

Wymore: 90 percent

Minor components: 10 percent

Component Descriptions

Wymore

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Ridges in the uplands

Hillslope position: Backslopes and summits

Parent material: Clayey loess

Slope: 1 to 3 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: High (about 9.6 inches)

Shrink-swell potential: Very high (about 9.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 12 to 36 inches

Surface runoff class: High

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 2e

Typical profile:

Ap—0 to 8 inches; silty clay loam

AB—8 to 11 inches; silty clay loam

Bt1—11 to 37 inches; silty clay

Bt2—37 to 45 inches; silty clay loam

BC—45 to 51 inches; silty clay loam

C—51 to 79 inches; silty clay loam

Minor components

Baileyville

Extent: About 10 percent of the unit

Landform: Hillsides in the uplands

Slope: 1 to 3 percent

Drainage class: Moderately well drained

Ecological site: Clay Upland (pe30-37)

7683—Wymore silty clay loam, 3 to 6 percent slopes

Map Unit Composition

Wymore: 90 percent

Minor components: 10 percent

Component Descriptions

Wymore

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Interfluves in the uplands

Hillslope position: Shoulders

Parent material: Loess

Slope: 3 to 6 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: High (about 9.7 inches)

Shrink-swell potential: Very high (about 9.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 12 to 17 inches

Surface runoff class: High

Ecological site: Loamy Lowland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 7 inches; silty clay loam

BA—7 to 12 inches; silty clay loam

Bt—12 to 39 inches; silty clay

BC—39 to 47 inches; silty clay loam

C—47 to 80 inches; silty clay loam

Minor components

Pawnee

Extent: About 10 percent of the unit

Landform: Hillslopes in the uplands

Slope: 2 to 6 percent

Drainage class: Moderately well drained

Ecological site: Clay Upland (pe30-37)

7688—Wymore-Baileyville complex, 3 to 6 percent slopes, eroded

Map Unit Composition

Wymore: 45 percent

Baileyville: 40 percent

Minor components: 15 percent

Component Descriptions

Wymore

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillsides in the uplands

Hillslope position: Backslopes and shoulders

Parent material: Clayey loess

Slope: 3 to 6 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Moderate (about 8.5 inches)

Shrink-swell potential: Very high (about 9.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 12 to 36 inches

Surface runoff class: High

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 6 inches; silty clay loam

Bt1—6 to 34 inches; silty clay

Bt2—34 to 42 inches; silty clay

BC—42 to 53 inches; silty clay loam

C—53 to 79 inches; silty clay loam

Baileyville

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillsides in the uplands

Hillslope position: Backslopes

Parent material: Clayey loess over loamy pedis sediment over clayey till

Slope: 3 to 6 percent

Drainage class: Moderately well drained

Slowest permeability: Slow (about 0.06 inch per hour)

Available water capacity: Moderate (about 7.7 inches)

Shrink-swell potential: Very high (about 9.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: About 12 to 36 inches

Surface runoff class: High

Ecological site: Clay Upland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 6 inches; silty clay

Bt1—6 to 19 inches; silty clay

Bt2—19 to 32 inches; silty clay

2Ab—32 to 36 inches; silty clay loam

2Btb1—36 to 43 inches; silty clay loam

3Btb2—43 to 48 inches; clay loam

3Btb3—48 to 76 inches; clay

Minor components

Otoe

Extent: About 10 percent of the unit

Landform: Hillslopes in the uplands

Slope: 4 to 6 percent

Drainage class: Moderately well drained

Ecological site: Clay Upland (pe30-37)

Pawnee

Extent: About 5 percent of the unit

Landform: Hillsides in the uplands

Slope: 3 to 6 percent

Drainage class: Moderately well drained

Ecological site: Loamy Upland (pe30-37)

7750—Nodaway silt loam, occasionally flooded***Map Unit Composition***

Nodaway: 90 percent

Minor components: 10 percent

Component Descriptions**Nodaway**

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Flood plains in valleys

Parent material: Silty alluvium

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: Very high (about 13.0 inches)

Shrink-swell potential: Moderate (about 3.5 LEP)

Flooding frequency: Occasional

Depth to seasonal zone of saturation: About 33 to 38 inches

Surface runoff class: Low

Ecological site: Loamy Lowland (pe30-37)

Land capability (nonirrigated): 2w

Typical profile:

Ap—0 to 7 inches; silt loam

C1—7 to 14 inches; stratified silt loam

C2—14 to 45 inches; stratified silt loam

C3—45 to 60 inches; stratified silt loam

Minor components

Chase

Extent: About 4 percent of the unit

Landform: Flood plains in river valleys

Slope: 0 to 2 percent

Drainage class: Somewhat poorly drained

Ecological site: Loamy Lowland (pe30-37)

Kennebec

Extent: About 3 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

Zook

Extent: About 3 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Poorly drained

7851—Judson silt loam, 1 to 5 percent slopes

Map Unit Composition

Judson: 95 percent

Minor components: 5 percent

Component Descriptions

Judson

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Fan remnants in the uplands

Hillslope position: Footslopes

Parent material: Loamy colluvium

Slope: 1 to 5 percent

Drainage class: Well drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: Very high (about 13.0 inches)

Shrink-swell potential: Moderate (about 4.7 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Low

Ecological site: Loamy Lowland (pe30-37)

Land capability (nonirrigated): 2e

Typical profile:

Ap—0 to 7 inches; silt loam

A—7 to 25 inches; silt loam

AB—25 to 40 inches; silty clay loam

Bw—40 to 50 inches; silty clay loam

BC—50 to 80 inches; silty clay loam

Minor components

Kennebec

Extent: About 5 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

7920—Contrary silty clay loam, 5 to 9 percent slopes

Map Unit Composition

Contrary: 85 percent

Minor components: 15 percent

Component Descriptions

Contrary

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Shoulders and backslopes

Parent material: Loess

Slope: 5 to 9 percent

Drainage class: Well drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: Very high (about 12.3 inches)

Shrink-swell potential: Moderate (about 4.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Medium

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 6 inches; silty clay loam

Bw—6 to 32 inches; silt loam

C—32 to 80 inches; silt loam

Minor Components

Morrill

Extent: About 8 percent of the unit
Landform: Hillslopes in the uplands
Slope: 6 to 12 percent
Drainage class: Well drained
Ecological site: Loamy Lowland (pe30-37)

Kennebec

Extent: About 7 percent of the unit
Landform: Flood plains in valleys
Slope: 0 to 2 percent
Drainage class: Moderately well drained
Ecological site: Loamy Lowland (pe30-37)

7965—Monona silt loam, 2 to 5 percent slopes

Map Unit Composition

Monona: 90 percent
 Minor components: 10 percent

Component Descriptions

Monona

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills
Landform: Interfluves in the uplands
Hillslope position: Shoulders and summits
Parent material: Loess
Slope: 2 to 5 percent
Drainage class: Well drained
Slowest permeability: Moderate (about 0.60 inch per hour)
Available water capacity: Very high (about 12.6 inches)
Shrink-swell potential: Moderate (about 3.9 LEP)
Flooding hazard: None
Depth to seasonal zone of saturation: More than 6 feet
Surface runoff class: Low
Ecological site: Loamy Upland (pe30-37)
Land capability (nonirrigated): 2e

Typical profile:

Ap—0 to 6 inches; silt loam
 AB—6 to 11 inches; silt loam
 Bw—11 to 30 inches; silt loam
 C—30 to 80 inches; silt loam

Minor components

Pohocco

Extent: About 10 percent of the unit
Landform: Hillslopes in the uplands
Slope: 5 to 17 percent
Drainage class: Well drained
Ecological site: Loamy Upland (pe30-37)

7966—Monona silt loam, 5 to 11 percent slopes, eroded

Map Unit Composition

Monona: 82 percent

Minor components: 18 percent

Component Descriptions

Monona

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Shoulders and backslopes

Parent material: Loess

Slope: 5 to 11 percent

Drainage class: Well drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: Very high (about 12.5 inches)

Shrink-swell potential: Moderate (about 3.9 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Medium

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 3e

Typical profile:

Ap—0 to 6 inches; silt loam

Bw—6 to 30 inches; silt loam

C—30 to 80 inches; silt loam

Minor components

Netawaka

Extent: About 10 percent of the unit

Landform: Hillslopes in the uplands

Slope: 10 to 15 percent

Drainage class: Well drained

Ecological site: Loamy Upland (pe30-37)

Pohocco

Extent: About 5 percent of the unit

Landform: Hillslopes in the uplands

Slope: 8 to 17 percent

Drainage class: Well drained

Ecological site: Loamy Upland (pe30-37)

Kennebec

Extent: About 3 percent of the unit

Landform: Flood plains in valleys

Slope: 0 to 2 percent

Drainage class: Moderately well drained

Ecological site: Loamy Lowland (pe30-37)

7981—Pohocco-Netawaka silt loams, 11 to 17 percent slopes, eroded

Map Unit Composition

Pohocco: 50 percent
Netawaka: 40 percent
Minor components: 10 percent

Component Descriptions

Pohocco

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Shoulders

Parent material: Fine-silty loess

Slope: 11 to 17 percent

Drainage class: Well drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: Very high (about 12.2 inches)

Shrink-swell potential: Moderate (about 3.7 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Medium

Ecological site: Loamy Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 5 inches; silt loam

Bw—5 to 20 inches; silt loam

Bk—20 to 39 inches; silt loam

C—39 to 80 inches; silt loam

Netawaka

MLRA: 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills

Landform: Hillslopes in the uplands

Hillslope position: Backslopes

Parent material: Fine-silty loess

Slope: 11 to 17 percent

Drainage class: Somewhat excessively drained

Slowest permeability: Moderate (about 0.60 inch per hour)

Available water capacity: Very high (about 12.5 inches)

Shrink-swell potential: Low (about 1.8 LEP)

Flooding hazard: None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: Medium

Ecological site: Limy Upland (pe30-37)

Land capability (nonirrigated): 4e

Typical profile:

Ap—0 to 6 inches; silt loam

AC—6 to 9 inches; silt loam

C—9 to 80 inches; silt loam

Minor components

Judson

Extent: About 5 percent of the unit*Landform:* Hillslopes in the uplands*Slope:* 2 to 6 percent*Drainage class:* Well drained*Ecological site:* Loamy Lowland (pe30-37)**7982—Pohocco-Netawaka silt loams, 17 to 30 percent slopes*****Map Unit Composition***

Pohocco: 50 percent

Netawaka: 40 percent

Minor components: 10 percent

Component Descriptions**Pohocco***MLRA:* 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills*Landform:* Hillslopes in the uplands*Hillslope position:* Shoulders*Parent material:* Fine-silty loess*Slope:* 17 to 30 percent*Drainage class:* Well drained*Slowest permeability:* Moderate (about 0.60 inch per hour)*Available water capacity:* Very high (about 12.2 inches)*Shrink-swell potential:* Moderate (about 3.7 LEP)*Flooding hazard:* None*Depth to seasonal zone of saturation:* More than 6 feet*Surface runoff class:* High*Ecological site:* Loamy Upland (pe30-37)*Land capability (nonirrigated):* 6e*Typical profile:*

Ap—0 to 5 inches; silt loam

Bw—5 to 20 inches; silt loam

Bk—20 to 39 inches; silt loam

C—39 to 80 inches; silt loam

Netawaka*MLRA:* 106—Nebraska and Kansas Loess-Drift Hills; 107—Iowa and Missouri Deep Loess Hills*Landform:* Hillslopes in the uplands*Hillslope position:* Backslopes and shoulders*Parent material:* Fine-silty loess*Slope:* 17 to 30 percent*Drainage class:* Somewhat excessively drained*Slowest permeability:* Moderate (about 0.60 inch per hour)*Available water capacity:* Very high (about 12.5 inches)*Shrink-swell potential:* Low (about 1.8 LEP)*Flooding hazard:* None

Depth to seasonal zone of saturation: More than 6 feet

Surface runoff class: High

Ecological site: Limy Upland (pe30-37)

Land capability (nonirrigated): 6e

Typical profile:

Ap—0 to 6 inches; silt loam

AC—6 to 9 inches; silt loam

C—9 to 80 inches; silt loam

Minor components

Judson

Extent: About 10 percent of the unit

Landform: Fan remnants in the uplands

Slope: 2 to 6 percent

Drainage class: Well drained

Ecological site: Loamy Lowland (pe30-37)

9971—Arents, earthen dam

Component Description

Arents, earthen dam, are barriers constructed to control the flow or raise the level of water. The dams are usually constructed with earthen material. They may be covered with earthy material or armored with concrete or rock.

9983—Gravel pits and quarries

Component Description

Pits are open excavations from which soil and commonly underlying material have been removed, exposing either rock or other material. Kinds include Pits, mine; Pits, gravel; and Pits, quarry. Commonly, pits are closely associated with dumps.

9986—Miscellaneous water

Component Description

Miscellaneous water is a small, constructed water area that is used for industrial, sanitary, or mining applications and contains water most of the year.

9999—Water

Component Description

This map unit includes streams, lakes, ponds, and estuaries. These areas are covered with water in most years, at least during the period that is warm enough for plants to grow. Many areas are covered with water throughout the year.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and forestland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and as wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited*, *somewhat limited*, and *very limited*. The suitability ratings are expressed as *well suited*, *moderately suited*, *poorly suited*, and *unsuited* or as *good*, *fair*, *poor*, and *very poor*.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation

Service is explained and the estimated yields of the main crops and pasture plants are listed.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit.

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, 2*e*. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6. These units are not given in all soil surveys.

The capability classification of map units in this survey area is given in table 6.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

The *General Crop Production Index* is a relative rating of the capacity of a soil to produce a specific plant under a defined management system. The index in table 7 is determined from soil properties. It is used to rank the map units based on potential yield capability. It can be used to estimate the net returns from crops, land assessment values, and to perform risk analysis when land management decisions are made.

Rangeland

In areas that have similar climate and topography, differences in the kind and amount of rangeland or forest understory vegetation are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 8 shows, for each soil that supports vegetation suitable for grazing, the ecological site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. An explanation of the column headings in table 8 follows.

An *ecological site* is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of

vegetation). The hydrology of the site is influenced by development of the soil and plant community. The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Total dry-weight production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Yields are adjusted to a common percent of air-dry moisture content.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *maximum rangeland composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range similarity index and rangeland trend. Range similarity index is determined by comparing the present plant community with the potential natural plant community on a particular rangeland ecological site. The more closely the existing community resembles the potential community, the higher the range similarity index. Rangeland trend is defined as the direction of change in an existing plant community relative to the potential natural plant community. Further information about the range similarity index and rangeland trend is available on the Internet in chapter 4 of the "National Range and Pasture Handbook."

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, an area with a range similarity index somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Forestland Management and Productivity

Gary A. Kuhn, forester, Natural Resources Conservation Service, helped prepare this section.

Approximately 19,700 acres in Brown County, or about 5 percent of the land area, is forestland. An additional 9,500 acres, or 3 percent of the land area, is composed of wooded strips or of land classified as nonforest covered with trees. The productive forestland capable of producing valuable wood products is along the bottom land rivercourses and on the north slopes of drainageways.

The potential productivity of a site is influenced by many factors. Soil characteristics, slope, aspect, and frequency of flooding all affect the tree species, composition, and productivity of a particular site. Soils along flood plains, such as Chase, Kennebec, Muscotah, and Nodaway soils, are very productive. Common trees in these areas are

eastern cottonwood, green ash, hackberry, red oak, bur oak, black walnut, American sycamore, American basswood, American elm, and red elm. The gentle breaks or footslopes near flood plains are also productive and support red oak, bur oak, white oak, black walnut, and hackberry. The north aspects, including areas of Padonia and Martin soils, also support these species. Towards the top of the slope on north aspects, in areas of Kipson, Pawnee, Wymore, and Vinland soils, shagbark hickory and bitternut hickory are more predominant along with chinkapin oak and honeylocust. On south- and west-facing slopes, where moisture is limited, honeylocust, Osage-orange, and eastern redcedar tend to encroach into areas of unmanaged pasture. Shelby, Steinauer, Morrill, and Burchard soils are examples of the drier soils on south and west aspects.

Timber stand improvement activities, such as thinning, weeding, and pruning, can improve the quality and quantity of wood products. Tree planting or natural reseeding may be needed to establish trees that have more timber value. For example, black walnut, which is a high-value species, is commonly only in scattered areas on flood plains. Over the years this species has been cut out, leaving mainly ash, hackberry, cottonwood, or honeylocust. Creating openings and controlling weeds allow the walnut to naturally seed or to be successfully planted. These practices are also beneficial for such species as red oak and bur oak. Timber stand improvement measures should be applied as the new trees are becoming established. Livestock grazing should not be allowed in areas designed for woodland production. The livestock will browse or trample desirable tree seedlings and can cause severe surface compaction, which hinders the infiltration of air and water into the soil. A forester should be consulted when timber harvest or improvement activities are planned.

Much of the forestland on the flood plains and on the gentle slopes has been cleared for crop production. Some of these sites could be replanted to trees depending on the objective of the landowner. Plantings of walnut, oak/ash, and hackberry on deep, well drained soils on flood plains can produce quality timber and firewood if managed properly. Filter strip plantings of green ash, black locust, silver maple, and honeylocust next to cropland adjacent to stream channels can help to protect streambanks and improve water quality. A forester should be consulted if the objective of tree planting is to provide income from timber or firewood.

Table 9 can be used by forestland owners or forest managers in planning the use of soils for wood crops. The table lists the *ordination symbol* for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the ordination symbol, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter R indicates steep slopes; X, stoniness or rockiness; W, excess water in or on the soil; T, toxic substances in the soil; D, restricted rooting depth; C, clay in the upper part of the soil; S, sandy texture; F, a high content of rock fragments in the soil; L, low strength; and N, snowpack. The letter A indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, L, and N.

In the table, *slight*, *moderate*, and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary

conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in forestland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

In table 9, the *potential productivity* of merchantable or *common trees* on a soil is expressed as a site index. The *site index* is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that forest managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. More detailed information regarding site index is available in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet (USDA, National forestry manual).

The first species listed under common trees for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to manage are those that are preferred for planting, seeding, or natural regeneration and those that remain in the stand after thinning or partial harvest.

Windbreaks and Environmental Plantings

Gary A. Kuhn, forester, Natural Resources Conservation Service, helped prepare this section.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Most windbreak plantings in Brown County provide farmstead protection. The most common tree and shrub species in existing windbreaks are eastern redcedar, Austrian pine, Scotch pine, honeylocust, hackberry, Siberian elm, green ash, cotoneaster, autumn-olive, American plum, and Tatarian honeysuckle. Esthetic plantings around the farmsteads may include such species as eastern white pine, Colorado blue spruce, pin oak, red oak, bur oak, silver maple, and various species of crabapple. Ponderosa pine has been planted in some of the farmstead windbreaks; however, this species is not recommended in this area because of its susceptibility to tip moth and tip blight damage. Height growth is severely affected, and the trees will have a stunted appearance with a "rounded crown." Healthy pines should have a conical shape. A large number of shrub plantings consisting of Tatarian honeysuckle are infested with the honeysuckle aphid. This insect causes severe loss of growth and vigor in Tatarian honeysuckle. A visual symptom is individual dead branches forming a "witch's broom" causing an unsightly appearance. No effective treatment is known other than removing the infested branches. New varieties of honeysuckle are now available that are resistant to this insect.

Most of the windbreaks are in upland areas of Grundy, Marshall, Monona, Aksarben, and Wymore soils. Eastern redcedar, Austrian pine, and Scotch pine grow well on these soils. Better height growth of these species as well as of deciduous trees and shrubs can be expected on Marshall and Monona soils because they have a lower content of clay than the Grundy, Aksarben, and Wymore soils.

A major concern affecting existing windbreaks in Brown County is the encroachment of smooth brome, which is a cool-season grass. This encroachment creates a sodbound condition. Many of the farmstead windbreaks in the area have become sodbound with this grass, especially the leeward rows of deciduous trees, which are unable to shade out the brome as effectively as the windward rows of cedar or pine. Some tree species, such as green ash, honeylocust, black walnut, and hackberry, will stagnate once brome moves in. Smooth brome is a competitive species because it uses moisture and nutrients during the same growing period as the trees and shrubs. Its dense root system uses most of the soil moisture. Most of the tree roots that obtain water and nutrients are in the upper 2 feet of the soil, and thus the trees cannot compete with this grass for moisture. The effects of this competition are amplified

during drought conditions. During these periods the trees can become so severely stressed that they are unable to fight off attacks by insects or disease. Also, smooth brome produces toxins that retard tree growth. The most effective method for controlling smooth brome is applying post-emergent herbicides. Typically, two applications are required—once during the spring and once in the fall. Pre-emergent herbicides can also be effective in keeping brome from invading new windbreak plantings. A new product is now being used for tree plantings in Kansas that may prove to be an excellent method of weed control, especially for brome sites. It is a woven polyurethane fabric that is laid down after the seedlings are planted. The fabric provides an effective weed barrier for 5 years. The planting site should be well prepared before the trees are planted and the weed barrier is installed. Such preparation includes killing the brome sod. Ideally, the brome sod should be killed the year before the site is planted and the site should be fallowed so that it can store moisture before the trees are planted.

Establishing windbreaks and environmental plantings requires careful planning. Location, suitability of the soil for the species to be planted, site preparation, planting technique, and maintenance are all essential factors that should be considered before any windbreak is planted. Most windbreaks are established on the north and west sides of farmsteads and placed at a specified distance away. The trees and shrubs to be planted must be suited to the soil and climate of the area. The planting site should be well prepared before planting begins, and a minimum 3- to 5-year weed control schedule should be followed.

More trees and shrubs could be planted in Brown County for wildlife habitat. These plantings can be located along field borders, in corners, or in areas next to cropland that are idle and impractical to farm. They provide valuable cover for wildlife and shelter during winter storms. Clump plantings of evergreens and shrubs are the most suitable for these plantings. Small deciduous trees, such as crabapple, hawthorn, Russian-olive, and mulberry, are also suitable. Commonly, evergreens, such as eastern redcedar, are established to the north and shrubs and small deciduous trees to the south.

Field windbreaks for crop protection can be beneficial on fields that are relatively flat and are subject to severe winds. One to three rows of trees planted at right angles to the prevailing wind can protect winter wheat from winterkill and trap snow for increased crop yields. The windbreaks also protect spring crops from hot southerly winds in the summer and reduce the evaporation rate, thus increasing the available moisture for crop production.

The zone of protection afforded to crops behind a windbreak is generally a distance 10 times the height of the windbreak (10H). Some benefits of windbreaks extend to 20 times the height of the windbreak (20H).

For example, a row of green ash 25 feet tall provides good protection to a distance of 250 feet on the leeward side and some wind reduction to a distance of 500 feet. The benefits are derived by reducing the velocity of the wind. Wind velocity is reduced by 50 to 75 percent by a protection zone of 0-8H, by 30 to 50 percent by a protection zone of 10H, and by 20 to 30 percent by a protection zone of 20H. The intervals used for field windbreaks depend on the soil type, the size of equipment, and the type of crop in a rotation that benefits the most from windbreak protection.

Table 10 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in the table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service or from a commercial nursery.

Recreation

Kenneth A. Kuiper, biologist, Natural Resources Conservation Service, helped prepare this section.

Brown County has several areas of scenic, geologic, and historic interest. Watershed lakes, farm ponds, and streams provide opportunities for fishing and other water-oriented recreation on privately owned land. Private membership recreation areas within the county provide camping, picnicking, skating, and fishing. Indian reservations for the Kickapoo and the Sac-Fox Indian tribes sponsor annual powwows that attract many visitors.

Brown County is quite diverse geologically. It varies from flat bottom lands dissected by wooded streams to steep loess hills and bluffs that are unique to this corner of Kansas.

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for recreation. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in table 11 can be supplemented by other information in this survey, for example, interpretations for building site development, sanitary facilities, agricultural waste management, construction materials, and water management.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of

vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Wildlife Habitat

Kenneth A. Kuiper, biologist, Natural Resources Conservation Service, helped prepare this section.

The primary game species of Brown County are bobwhite quail, mourning dove, cottontail rabbit, fox, squirrel, white-tailed deer, ring-neck pheasant, turkey, and several species of waterfowl.

Nongame species are numerous because of the diversity of habitat types. Cropland, woodland, and pastureland are intermixed throughout the county, creating the desirable edge effect conducive to many wildlife species. Each of these habitat types can provide food, cover, water, and space for wildlife.

Furbearers are common along many of the streams, and a limited amount of trapping is done.

Stockwater ponds and streams provide good to excellent fishing. Species commonly taken in the county are bass, channel catfish, flathead catfish, carp, and bluegill.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and

water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 12, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are fescue, lovegrass, brome grass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. These plants provide essential habitat for wetland wildlife species. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, sage grouse, meadowlark, and lark bunting.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, agricultural waste management, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading "Soil Properties."

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil

structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table 13 shows the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil

properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Table 14 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the

soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A *trench sanitary landfill* is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The

surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Agricultural Waste Management

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

Table 15 shows the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of these tables, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in

this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the tables are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops (application of manure and food-processing waste, application of sewage sludge, and disposal of wastewater by irrigation) and for waste management systems that are designed only for the purpose of wastewater disposal and treatment (overland flow of wastewater, rapid infiltration of wastewater, and slow rate treatment of wastewater).

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are either solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant

growth, and microbial activity include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Disposal of wastewater by irrigation not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings in the table are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

Overland flow of wastewater is a process in which wastewater is applied to the upper reaches of sloped land and allowed to flow across vegetated surfaces, sometimes called terraces, to runoff-collection ditches. The length of the run generally is 150 to 300 feet. The application rate ranges from 2.5 to 16.0 inches per week. It commonly exceeds the rate needed for irrigation of cropland. The wastewater leaves solids and nutrients on the vegetated surfaces as it flows downslope in a thin film. Most of the water reaches the collection ditch, some is lost through evapotranspiration, and a small amount may percolate to the ground water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, and the design and construction of the system. Reaction and the cation-exchange capacity affect absorption. Reaction, salinity, and the sodium adsorption ratio affect plant growth and microbial activity. Slope, permeability, depth to a water table, ponding, flooding, depth to bedrock or a cemented pan, stones, and cobbles affect design and construction. Permanently frozen soils are unsuitable for waste treatment.

Rapid infiltration of wastewater is a process in which wastewater applied in a level basin at a rate of 4 to 120 inches per week percolates through the soil. The wastewater may eventually reach the ground water. The application rate commonly exceeds the rate needed for irrigation of cropland. Vegetation is not a necessary part of the treatment; hence, the basins may or may not be vegetated. The thickness of the soil material needed for proper treatment of the wastewater is more than 72 inches. As a result, geologic and hydrologic investigation is needed to ensure proper design and performance and to determine the risk of ground-water pollution.

The ratings in the table are based on the soil properties that affect the risk of pollution and the design, construction, and performance of the system. Depth to a water table, ponding, flooding, and depth to bedrock or a cemented pan affect the risk of pollution and the design and construction of the system. Slope, stones, and cobbles also affect design and construction. Permeability and reaction affect performance. Permanently frozen soils are unsuitable for waste treatment.

Slow rate treatment of wastewater is a process in which wastewater is applied to land at a rate normally between 0.5 inch and 4.0 inches per week. The application rate commonly exceeds the rate needed for irrigation of cropland. The applied wastewater is treated as it moves through the soil. Much of the treated water may percolate to the ground water, and some enters the atmosphere through evapotranspiration. The applied

water generally is not allowed to run off the surface. Waterlogging is prevented either through control of the application rate or through the use of tile drains, or both.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, and the application of waste. The properties that affect absorption include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, depth to bedrock or a cemented pan, reaction, the cation-exchange capacity, and slope. Reaction, the sodium adsorption ratio, salinity, and bulk density affect plant growth and microbial activity. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood of wind erosion or water erosion. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Construction Materials

Tables 16a and 16b give information about the soils as potential sources of gravel, sand, reclamation material, roadfill, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

Gravel and *sand* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 16a, only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of gravel or sand are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains gravel or sand, the soil is considered a likely source regardless of thickness. The assumption is that the gravel or sand layer below the depth of observation exceeds the minimum thickness. The soils are rated *good*, *fair*, or *poor* as potential sources of gravel and sand. A rating of *good* or *fair* means that the source material is likely to be in or below the soil.

The soils are rated *good*, *fair*, or *poor* as potential sources of reclamation material, roadfill, and topsoil. The features that limit the soils as sources of these materials are specified in table 16b.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as

inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 17 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected.

Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above

the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey.

Soil properties are ascertained by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

Engineering Index Properties

Table 18 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 2). "Loam," for example, is soil

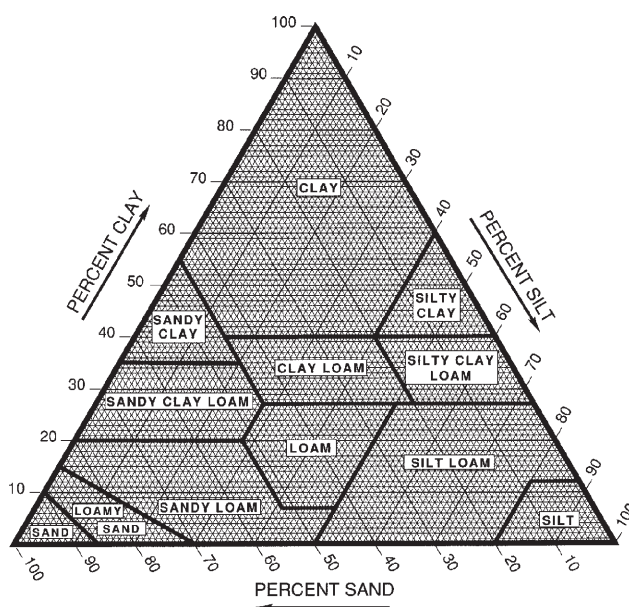


Figure 2.—Percentages of clay, silt, and sand in the basic USDA textural classes.

that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2001) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2000).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical Properties

Table 19 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In table 19, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In table 19, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In table 19, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $1/3$ - or $1/10$ -bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at $1/3$ - or $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If

the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 19, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in table 19 as the K factor (Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of several factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.
- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams.
4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.
8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Properties

Table 20 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area.

The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Soil Features

Table 21 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness of the restrictive layer, which significantly affects the ease of excavation. *Depth to top* refers to the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly

structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Water Features

Table 22 gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Soil saturation refers to a water table, or a saturated zone in the soil. Table 22 indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1998; Soil Survey Staff, 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 23 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is *Udoll* (*Ud*, meaning humid, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludolls (*Hapl*, meaning minimal horizonation, plus *udoll*, the suborder of the Mollisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Hapludolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, superactive, mesic Typic Hapludolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetical order. Characteristics of each soil and the

material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (Soil Survey Division Staff, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 1998). Following the pedon description is the range of important characteristics of the soils in the series.

Aksarben Series

The Aksarben series consists of very deep, well drained soils that formed in loess. These soils are on uplands. Permeability is moderately slow. Slopes range from 0 to 11 percent. The mean annual temperature is about 52 degrees F, and the mean annual precipitation is about 29 inches.

Taxonomic classification: Fine, smectitic, mesic Typic Argiudolls

Typical Pedon

Aksarben silty clay loam (fig. 3), on a convex slope of 1 percent, in a cultivated field about 6 miles south and 4 miles east of Wahoo, in Saunders County, Nebraska; 810 feet north and 1,875 feet west of the southeast corner of sec. 4, T. 13 N., R. 8 E.; Wahoo SE. USGS topographic quadrangle; lat. 41 degrees 07 minutes 12 seconds N. and long. 96 degrees 31 minutes 39 seconds W. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable; many very fine and fine roots throughout; many fine and medium tubular pores; moderately acid; abrupt smooth boundary.
- A—6 to 12 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable; many very fine and fine roots throughout; many fine and medium tubular pores; moderately acid; clear smooth boundary.
- Bt1—12 to 18 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure parting to strong fine subangular blocky; hard, firm; common fine roots throughout; common fine tubular pores; many faint very dark grayish brown (10YR 3/2) continuous clay films (cutans) on vertical and horizontal faces of peds; slightly acid; clear smooth boundary.
- Bt2—18 to 26 inches; brown (10YR 4/3) silty clay loam, brown (10YR 5/3) dry; few fine faint dark yellowish brown (10YR 4/6) iron masses in the soil matrix; the iron accumulations are relict redoximorphic features; moderate coarse subangular blocky structure parting to strong fine and medium subangular blocky; hard, firm; few fine roots throughout; few fine tubular pores; many faint dark brown (10YR 3/3) continuous clay films (cutans) on vertical and horizontal faces of peds; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.
- Bt3—26 to 34 inches; brown (10YR 4/3) silty clay loam, pale brown (10YR 6/3) dry; prominent strong brown (7.5YR 5/6) iron masses in the soil matrix; the iron accumulations are relict redoximorphic features; moderate coarse prismatic structure parting to strong medium subangular blocky; hard, firm; few very fine roots throughout; few very fine tubular pores; many faint dark brown (10YR 3/3) continuous clay films (cutans) on vertical and horizontal faces of peds; common fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.
- Bt4—34 to 42 inches; brown (10YR 5/3) silty clay loam, pale brown (10YR 6/3) dry; prominent strong brown (7.5YR 5/6) iron masses in the soil matrix; the iron

accumulations are relict redoximorphic features; strong coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; few very fine roots throughout; common very fine tubular pores; common distinct brown (10YR 4/3) discontinuous clay films (cutans) on vertical and horizontal faces of peds; common fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

BC—42 to 60 inches; brown (10YR 5/3) silty clay loam, very pale brown (10YR 7/3) dry; many coarse distinct yellowish brown (10YR 5/6) iron masses in the soil matrix; the iron accumulations are relict redoximorphic features; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable; few very fine roots throughout; common fine tubular pores; common discontinuous pressure faces on vertical faces of peds; many fine and medium irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

C—60 to 80 inches; grayish brown (2.5Y 5/2) silt loam, light gray (2.5Y 7/2) dry; many fine prominent strong brown (7.5YR 5/8) and common medium strong brown (7.5YR 5/6) iron masses in the soil matrix; the iron accumulations are relict redoximorphic features; massive; hard, friable; common fine tubular pores; discontinuous pressure faces on vertical faces of peds; many fine and medium irregular soft masses of iron-manganese; neutral.

Range in Characteristics

Soil moisture regime: Udic

Depth to argillic horizon: 6 to 20 inches

Depth to redoximorphic concentrations: 12 to 36 inches; the mottling pattern is a relict feature and is not considered indicative of present drainage conditions.

Thickness of the mollic epipedon: 10 to 24 inches (extends into the upper part of the Bt horizon)

Thickness of the solum: 30 to 72 inches

Reaction: Moderately acid or strongly acid in the most acid part of the solum

Particle-size control section (weighted average): Silty clay loam

Content of clay in the particle-size control section (weighted average): 35 to 42 percent

A horizon:

Hue—10YR

Value—2 or 3 moist, 3 or 4 dry

Chroma—1 or 2, moist or dry

Texture—silty clay loam

Content of clay—27 to 35 percent

Reaction—slightly acid to strongly acid

Thickness of the horizon—6 to 20 inches

Bt horizon:

Hue—10YR (upper part); 10YR or 2.5Y (lower part)

Value—3 or 4 moist, 4 or 5 dry (upper part); 4 to 6 moist, 5 to 7 dry (lower part)

Chroma—2 or 3 (upper part); 2 to 4 (lower part) (moist or dry for both)

Redoximorphic concentrations—hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 or 5

Texture—silty clay loam or silty clay

Content of clay—35 to 42 percent

Reaction—slightly acid to strongly acid

Thickness of the horizon—18 to 48 inches

Special features—redoximorphic concentrations that are considered relict

BC horizon:

Hue—10YR or 2.5Y

Value—4 to 6 moist, 5 to 7 dry



Figure 3.—Profile of Aksarben silty clay loam. Depth is marked in feet.

Chroma—2 to 4, moist or dry

Redoximorphic concentrations—hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 or 5

Texture—silty clay loam

Content of clay—27 to 35 percent

Reaction—slightly acid to moderately acid

Thickness of the horizon—6 to 20 inches

Special features—redoximorphic concentrations that are considered relict

C horizon:

Hue—10YR or 2.5Y

Value—4 to 6, 5 to 7 dry

Chroma—2 to 4, moist or dry

Redoximorphic concentrations—hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 or 5

Texture—silty clay loam or silt loam

Content of clay—24 to 35 percent

Reaction—neutral to slightly acid

Special features—redoximorphic concentrations that are considered relict

Baileyville Series

The Baileyville series consists of very deep, moderately well drained soils that formed in loess, pedis sediment, and a paleosol that formed in glacial till. These soils are on loess covered glaciated uplands. Permeability is slow or very slow. Slopes range from 1 to 7 percent. The mean annual precipitation is about 35 inches and the mean annual air temperature is about 55 degrees F.

Taxonomic classification: Fine, smectitic, mesic Oxyaquic Vertic Argiudolls

Typical Pedon

Baileyville silty clay, on a convex northeast-facing slope of 3 percent, in a cultivated field about 2 miles west and 1 mile north of Seneca, in Nemaha County, Kansas; 1,760 feet west and 980 feet north of the southeast corner of sec. 19., T. 2 S., R. 12 E.; Seneca USGS topographic quadrangle; lat. 39 degrees 51 minutes 29.52 seconds N. and long. 96 degrees 06 minutes 52.9 seconds W. When described, the soil was moist throughout. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 5 inches; very dark gray (10YR 3/1) exterior, silty clay; moderate fine granular structure; friable, hard, moderately sticky and moderately plastic; common fine and medium roots throughout; noneffervescent (by HCl, 1N); slightly acid; linear extensibility percent is 8; abrupt smooth boundary.

Bt1—5 to 10 inches; very dark gray (10YR 3/1) exterior, silty clay; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm, very hard, very sticky and very plastic; common fine and medium roots throughout; common faint very dark gray (10YR 3/1) (moist) clay films on all faces of peds; noneffervescent (by HCl, 1N); moderately acid; linear extensibility percent is 13; gradual smooth boundary.

Bt2—10 to 13 inches; very dark grayish brown (10YR 3/2) exterior, silty clay; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm, very hard, very sticky and very plastic; common fine and few medium roots throughout; common discontinuous distinct very dark gray (10YR 3/1) (moist) clay films on all faces of peds; noneffervescent (by HCl, 1N); moderately acid; 10YR 3/1 fill in old crack channels; linear extensibility percent is 10; gradual smooth boundary.

Bt3—13 to 19 inches; dark grayish brown (10YR 4/2) exterior, silty clay; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm, very hard, very sticky and very plastic; common fine roots throughout; common discontinuous distinct very dark grayish brown (10YR 3/2) (moist) clay films on all faces of peds; 2 percent prominent spherical iron-manganese concretions

throughout and common fine prominent irregular strong brown (7.5YR 5/6) (moist) masses of oxidized iron infused into matrix adjacent to pores; noneffervescent (by HCl, 1N); slightly acid; 10YR 3/1 fill in old crack channels; linear extensibility percent is 7; gradual smooth boundary.

Bt4—19 to 32 inches; grayish brown (2.5Y 5/2) exterior, silty clay ; weak medium prismatic structure parting to moderate and fine subangular blocky; firm, very hard, very sticky and very plastic; few fine roots throughout; common discontinuous distinct dark grayish brown (10YR 4/2) (moist) clay films on all ped faces; 2 percent prominent spherical iron-manganese concretions throughout and common prominent irregular strong brown (7.5YR 5/6) (moist) masses of oxidized iron infused into matrix along ped faces; non effervescent (by HCl, 1N); neutral; 10YR 3/1 fill in old crack channels; linear extensibility percent is 4; abrupt smooth boundary.

2Ab—32 to 36 inches; dark gray (10YR 4/1) exterior, silty clay loam; weak fine and medium subangular blocky structure; friable; slightly hard, slightly sticky and slightly plastic; few fine roots throughout; common fine prominent irregular brown (7.5YR 4/4) (moist) masses of oxidized iron infused into matrix along ped faces; noneffervescent (by HCl, 1N); neutral; linear extensibility percent is 3; clear smooth boundary.

2Btb1—36 to 43 inches; brown (7.5YR 4/2) exterior, silty clay loam; weak medium prismatic structure parting to weak fine and medium subangular blocky; firm, hard, moderately sticky and moderately plastic; few fine roots throughout; few discontinuous distinct very dark grayish brown (10YR 3/2) (moist) clay films on all ped faces; 2 percent fine distinct spherical iron-manganese concretions and common fine and medium distinct irregular reddish brown (5YR 4/4) (moist) and dark brown (7.5YR 3/4) (moist) masses of oxidized iron with diffuse boundaries infused into matrix along ped faces; noneffervescent (by HCl, 1N); neutral; linear extensibility percent is 5; gradual smooth boundary.

3Btb2—43 to 48 inches; brown (7.5YR 4/2) exterior, clay loam; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm, hard, moderately sticky and moderately plastic; few fine roots between peds; few discontinuous distinct very dark grayish brown (10YR 3/2) (moist) clay films on all ped faces; 2 percent fine distinct spherical iron-manganese concretions and common fine and medium prominent irregular reddish brown (5YR 4/4) (moist) and distinct irregular strong brown (7.5YR 4/6) (moist) masses of oxidized iron with diffused boundaries infused into matrix along ped faces and common irregular gray (10YR 5/1) (moist) iron depletions infused into matrix along ped faces; noneffervescent (by HCl, 1N); neutral; linear extensibility percent is 7; gradual smooth boundary.

3Btb3—48 to 62 inches; brown (7.5YR 4/3) exterior, clay; weak medium prismatic structure parting to moderate fine and medium subangular blocky, very firm, very hard, very sticky; common discontinuous distinct brown (7.5YR 4/2) (moist) clay films on all ped faces; 2 percent fine prominent spherical iron-manganese concretions throughout and common fine and medium prominent irregular reddish brown (5YR 4/4) and distinct irregular strong brown (7.5YR 4/6) (moist) masses of oxidized iron infused into the matrix along ped faces and common irregular gray (10YR 5/1) (moist) iron depletions infused into matrix along ped faces; 2 percent subrounded very strongly cemented 2 to 15 mm quartzite fragments; noneffervescent (by HCl, 1N); neutral; linear extensibility percent is 10; gradual smooth boundary.

3Btb4—62 to 76 inches; strong brown (7.5YR 5/6) exterior, clay; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm, very hard, very sticky and very plastic; common discontinuous distinct brown (7.5YR 4/2) (moist) clay films on all ped faces; 2 percent fine prominent spherical

iron-manganese concretions throughout and common fine and medium prominent irregular reddish brown (5YR 5/4) (moist) and red (2.5YR 4/6) (moist) masses of oxidized iron infused into the matrix along ped faces and common prominent irregular gray (10YR 5/1) (moist) iron depletions infused into matrix along ped faces; 3 percent subrounded very strongly cemented 2 to 15 mm quartzite fragments; noneffervescent (by HCl, 1N); linear extensibility percent is 8; neutral.

Range in Characteristics

Soil moisture regime: Udic; the soil is wet in the control section from March through May.

Mean annual soil temperature: 53 to 57 degrees F

Depth to argillic horizon: 4 to 10 inches

Depth to pedisegment: 21 to 39 inches

Depth to glacial till: 30 to 59 inches

Depth to secondary calcium carbonate, in some pedons: 15 to 35 inches; carbonates are generally in the form of concretions.

Depth to redoximorphic concentrations: 12 to 30 inches

Redoximorphic features: Features in the form of iron masses and iron and manganese concretions are in the middle to lower subsoil and the underlying layers. In some pedons, the upper part of the subsoil may contain redoximorphic features which often may be masked by the matrix color.

Depth to episaturation: 18 to 36 inches from March through May

Depth to a marked sand increase: 21 to 39 inches; sand increases from less than 2 percent to more than 10 percent.

Thickness of the mollic epipedon: 10 to 24 inches

Content of clay in the particle-size control section (weighted average): 42 to 55 percent

Content of sand in the particle-size control section (weighted average): 1 to 2 percent

Other features: A thin AB horizon may be present in some pedons. A thin BC horizon may be present in some pedons. Slickensides may be present in some pedons.

A horizon:

Hue—10YR

Value—2 or 3 moist, 3 or 4 dry

Chroma—1 or 2

Texture—silty clay or silty clay loam

Content of clay—30 to 45 percent

Reaction—moderately acid to neutral

Bt horizon:

Hue—10YR or 2.5Y

Value—3 to 5 moist, 4 to 6 dry

Chroma—1 to 3, 1 (upper part)

Texture—silty clay or silty clay loam

Content of clay—35 to 55 percent

Content of sand—less than 2 percent

Reaction—moderately acid to neutral

2Ab horizon (if it occurs):

Hue—7.5YR or 10YR

Value—3 or 4 moist, 4 to 5 dry

Chroma—1 or 2

Texture—silty clay loam

Reaction—slightly acid or neutral

2Bt horizon:

Hue—7.5YR to 2.5Y

Value—4 or 5 moist, 5 or 6 dry
 Chroma—2 to 4
 Texture—silty clay loam or silty clay
 Content of clay—27 to 45 percent
 Content of sand—1 to 18 percent
 Reaction—slightly acid or neutral

3Bt horizon:

Hue—5YR to 10YR
 Value—4 or 5 moist, 5 or 6 dry
 Chroma—2 to 6
 Texture—clay, clay loam, or silty clay
 Content of clay—35 to 55 percent
 Content of sand—more than 10 percent
 Reaction—slightly acid to slightly alkaline

Burchard Series

The Burchard series consists of very deep, well drained soils that formed in calcareous glacial till. These soils are on uplands. Permeability is moderately slow. Slopes range from 2 to 40 percent. The mean annual precipitation is about 30 inches, and the mean annual air temperature is about 54 degrees F.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Argiudolls

Typical Pedon

Burchard clay loam, on a slope of 8 percent, in an area of native rangeland about 1 mile north and 2 miles east of Burchard, in Pawnee County, Nebraska; 400 feet west and 400 feet north of the southeast corner of sec. 5, T. 2 N., R. 10 E.; Burchard USGS topographic quadrangle; lat. 40 degrees 09 minutes 43 seconds N. and long. 96 degrees 18 minutes 50 seconds W. (Colors are for moist soil unless otherwise indicated.)

- A—0 to 13 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; moderate medium and fine granular structure; slightly hard, friable; many very fine and fine and few medium and coarse roots throughout; slightly acid; gradual wavy boundary.
- Bt—13 to 19 inches; 60 percent brown (10YR 4/3) and 40 percent mixing of dark grayish brown (10YR 4/2) clay loam, brown (10YR 5/3) and grayish brown (10YR 5/2) dry; moderate fine and very fine subangular blocky structure; hard, friable; thin discontinuous clay films on faces of peds; neutral; clear wavy boundary.
- Btk—19 to 29 inches; olive brown (2.5Y 4/4) clay loam, light yellowish brown (2.5Y 6/4) dry; moderate fine subangular blocky structure; hard, friable; common fine and medium roots throughout; thin discontinuous clay films on faces of peds; soft accumulations of segregated lime; slight effervescence; moderately alkaline; gradual wavy boundary.
- Bk—29 to 37 inches; light brownish gray (2.5Y 6/2) and dark yellowish brown (10YR 4/4) clay loam, light gray (2.5Y 7/2) dry and yellowish brown (10YR 5/4) dry; moderate medium angular blocky structure; hard, friable; few very fine and fine and medium roots in cracks; many medium and coarse soft accumulations of segregated lime; slight effervescence; moderately alkaline; gradual wavy boundary.
- C—37 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, light gray (2.5Y 7/2) dry; weak coarse and medium angular blocky structure; hard, firm; many fine seams and pockets of soft lime; 5 percent gravel, by volume; many coarse distinct yellowish brown (10YR 5/4) soft masses of iron accumulation; strong effervescence; moderately alkaline.

Range in Characteristics

Soil moisture regime: Udic

Depth to argillic horizon: 8 to 18 inches

Depth to secondary calcium carbonate: 12 to 30 inches

Depth to redoximorphic concentrations (if they occur): 22 to 80 inches

Content of clay in the particle-size control section (weighted average): 27 to 35 percent

Content of sand in the particle-size control section (weighted average): 20 to 45 percent
fine and coarser sand

Content of rock fragments in the particle-size control section (weighted average): 1 to
10 percent gravel, by volume

A horizon:

Hue—10YR

Value—3 to 5 dry, 2 or 3 moist

Chroma—1 or 2

Texture—loam, silt loam, or clay loam

Content of clay—18 to 30 percent

Reaction—moderately acid to neutral

Bt horizon:

Hue—10YR

Value—4 to 7 dry, 3 to 6 moist

Chroma—2 to 6

Texture—clay loam

Content of clay—27 to 35 percent; as much as 38 percent in some pedons

Reaction—slightly acid or neutral

Btk horizon:

Hue—10YR or 2.5Y

Value—4 to 7 dry, 3 to 6 moist

Chroma—2 to 6

Texture—loam or clay loam

Content of clay—18 to 30 percent

Calcium carbonate equivalent—5 to 10 percent

Reaction—slightly alkaline or moderately alkaline

Bk horizon (if it occurs):

Hue—10YR or 2.5Y

Value—4 to 7 dry, 3 to 6 moist

Chroma—2 to 6

Texture—loam or clay loam

Content of clay—18 to 30 percent

Calcium carbonate equivalent—5 to 10 percent

Reaction—slightly alkaline or moderately alkaline

C horizon:

Hue—10YR or 2.5Y

Value—6 or 7, moist or dry

Chroma—2 or 3

Texture—loam or clay loam

Content of clay—25 to 35 percent

Content of sand—30 to 45 percent

Calcium carbonate equivalent—10 to 15 percent

Content of gypsum—0 to 2 percent

Reaction—slightly alkaline or moderately alkaline

Chase Series

The Chase series consists of very deep soils that formed in alluvium. These soils are on flood plains. Permeability is very slow. Slopes range from 0 to 2 percent. The mean annual temperature is 56 degrees F, and the mean annual precipitation is 34 inches.

Taxonomic classification: Fine, smectitic, mesic Aquertic Argiudolls

Typical Pedon

Chase silty clay loam, in a cultivated field 1 mile northeast of Reading, in Lyon County, Kansas; 330 feet west and 2,000 feet north of the southeast corner of sec. 34, T. 17 S., R. 13 E. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 6 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; few wormcasts; moderately acid; clear smooth boundary.
- A—6 to 14 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; few fine irregular shaped iron-manganese concretions; moderately acid; gradual smooth boundary.
- BA—14 to 20 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few fine distinct dark brown (10YR 3/3) masses of iron accumulation; few fine rounded iron-manganese concretions; few fine wormholes; few wormcasts; slightly acid; gradual smooth boundary.
- Bt1—20 to 34 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; moderate medium and fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common medium distinct dark yellowish brown (10YR 4/4) irregularly shaped masses of iron accumulations; few fine rounded iron-manganese concretions; few fine clay films on faces of peds; few fine wormholes; few wormcasts; slightly acid; gradual smooth boundary.
- Bt2—34 to 42 inches; very dark brown (10YR 2/2) silty clay, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common fine distinct yellowish brown (10YR 5/4) irregularly shaped masses of iron accumulations; few fine rounded iron-manganese concretions; common fine clay films on ped faces; neutral; diffuse smooth boundary.
- BC—42 to 54 inches; very dark brown (10YR 2/2) silty clay loam, dark gray (10YR 4/1) dry; very weak blocky structure; hard, firm, sticky and plastic; few fine distinct yellowish brown (10YR 5/4) irregularly shaped masses of iron accumulations; few fine rounded iron-manganese concretions; neutral; diffuse smooth boundary.
- C—54 to 80 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark gray (10YR 4/1) dry; massive; hard, firm, sticky and plastic; few fine distinct yellowish brown (10YR 5/4) irregularly shaped iron accumulations; few fine rounded black iron-manganese concretions; slightly alkaline.

Range in Characteristics

Soil moisture regime: Udic

Depth to argillic horizon: 12 to 30 inches

Depth to redoximorphic concentrations: 6 to 20 inches

Depth to episaturation: 24 to 48 inches from January through April

Thickness of the mollic epipedon: More than 36 inches

Vertic features: Linear extensibility of 6.0 cm or more at a depth of 20 to 42 inches

Content of clay in the particle-size control section (weighted average): 35 to 55 percent

Content of sand in the particle-size control section (weighted average): 1 to 4 percent

A horizon:

Hue—10YR
 Value—2 or 3 moist, 3 to 5 dry
 Chroma—1 or 2
 Texture—silt loam or silty clay loam
 Content of clay—12 to 40 percent
 Reaction—moderately acid to neutral

BA horizon:

Hue—10YR
 Value—2 or 3 moist, 3 to 5 dry
 Chroma—1 or 2
 Texture—silty clay loam
 Content of clay—27 to 40 percent
 Reaction—moderately acid to neutral

Bt horizon:

Hue—10YR or 2.5Y
 Value—2 to 5 moist, 4 to 6 dry
 Chroma—1 or 2
 Texture—silty clay loam, silty clay, or clay
 Content of clay—35 to 55 percent
 Reaction—moderately acid to slightly alkaline

C horizon:

Hue—10YR or 2.5Y
 Value—2 to 5 moist, 4 to 6 dry
 Chroma—1 or 2
 Texture—silty clay loam or silty clay
 Content of clay—27 to 55 percent
 Reaction—slightly acid to moderately alkaline; fine carbonate concretions in some pedons

Contrary Series

The Contrary series consists of very deep, well drained soils that formed in loess. These soils are on uplands. Permeability is moderate. Slopes range from 5 to 14 percent. The mean annual temperature is 53 degrees F, and the mean annual precipitation is 33 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Dystric Eutrudepts

Typical Pedon

Contrary silt loam, on a convex slope of 12 percent in an area of pasture about 1.5 miles west of Willow Brook, in Buchanan County, Missouri; 1,100 feet west and 1,230 feet north of the center of sec. 33, T. 56 N., R. 35 W. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; many fine roots; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; abrupt smooth boundary.
- BE—8 to 14 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; few fine faint grayish brown (10YR 5/2) iron depletions that are relict redoximorphic features; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

- Bw1—14 to 21 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; few fine roots; few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation and common fine distinct grayish brown (2.5Y 5/2) iron depletions which are relict redoximorphic features; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; neutral; clear smooth boundary.
- Bw2—21 to 27 inches; grayish brown (2.5Y 5/2) silt loam; moderate medium subangular blocky structure; friable; few fine roots; common fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; distinct light gray (10YR 6/1) iron depletions; the matrix color, iron accumulations, and iron depletions are relict redoximorphic features; neutral; gradual smooth boundary.
- Bw3—27 to 32 inches; grayish brown (2.5Y 5/2) silt loam; moderate fine and medium subangular blocky structure; friable; many medium distinct brown (10YR 5/3) and common medium prominent yellowish brown (10YR 5/6) masses of iron accumulation; common fine distinct light gray (10YR 6/1) iron depletions; the matrix color, iron accumulations, and iron depletions are relict redoximorphic features; neutral; gradual smooth boundary.
- Bw4—32 to 37 inches; grayish brown (2.5Y 5/2) silt loam; moderate medium subangular blocky structure; friable; common medium distinct light olive brown (2.5Y 5/4) and many fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; common fine distinct light gray (10YR 6/1) iron depletions; the matrix color, iron accumulations, and iron depletions are relict redoximorphic features; neutral; gradual smooth boundary.
- BC—37 to 45 inches; grayish brown (2.5Y 5/2) silt loam; weak medium subangular blocky structure; friable; few fine distinct light olive brown (2.5Y 5/4) and few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; common fine distinct light gray (10YR 6/1) iron depletions; the matrix color, iron accumulations, and iron depletions are relict redoximorphic features; slightly acid; gradual smooth boundary.
- C—45 to 60 inches; grayish brown (2.5Y 5/2) silt loam; massive with some vertical cleavage; friable; many medium distinct light olive brown (2.5Y 5/4) and few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation; common fine distinct light brownish gray (10YR 6/2) iron depletions; the matrix color, iron accumulations, and iron depletions are relict redoximorphic features; neutral.

Range in Characteristics

Depth to free carbonates: 40 inches or more

Content of clay in the particle-size control section (weighted average): 20 to 30 percent

Content of sand in the particle-size control section (weighted average): Less than 10 percent

A horizon:

Hue—10YR

Value—2 or 3 moist, 3 to 5 dry

Chroma—2 or 3

Texture—silt loam or silty clay loam

Content of clay—20 to 35 percent

Reaction—moderately acid to neutral

BE horizon (if it occurs):

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—1 to 3

Texture—silt loam or silty clay loam

Content of clay—20 to 28 percent

Reaction—moderately acid to neutral

Special features—redoximorphic features that are considered relict

Bw horizon:

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—1 to 3

Texture—silt loam or silty clay loam

Content of clay—20 to 30 percent

Reaction—moderately acid to neutral

Special features—matrix colors and redoximorphic features that are considered relict

BC horizon:

Hue—10YR or 2.5Y

Value—5 or 6

Chroma—2 to 4

Texture—silt loam or silty clay loam

Content of clay—15 to 30 percent

Reaction—slightly acid to slightly alkaline

Special features—matrix colors and redoximorphic features that are considered relict

C horizon:

Hue—10YR or 2.5Y

Value—5 or 6

Chroma—2 to 4

Texture—silt loam

Content of clay—15 to 25 percent

Reaction—slightly acid to slightly alkaline

Special features—matrix colors and redoximorphic features that are considered relict

Grundy Series

The Grundy series consists of very deep, somewhat poorly drained, slowly permeable soils that formed in loess. These soils are on uplands. Slopes range from 0 to 9 percent. The mean annual temperature is 54 degrees F, and the mean annual precipitation is 35 inches.

Taxonomic classification: Fine, smectitic, mesic Aquertic Argiudolls

Typical Pedon

Grundy silt loam, on a slope of 3 percent, in a cultivated field about 2.5 miles north and 2 miles west of Ridgeway, in Harrison County, Missouri; 1,175 feet east and 125 feet south of the center of sec. 19, T. 65 N., R. 27 W. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; common fine and medium roots; neutral; clear smooth boundary.

A—9 to 11 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; common fine and medium roots; slightly acid; clear smooth boundary.

BA—11 to 14 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry;

moderate very fine subangular blocky structure; firm; common fine roots; slightly acid; clear smooth boundary.

Btg1—14 to 18 inches; dark grayish brown (10YR 4/2) silty clay; moderate very fine and fine subangular blocky structure; firm; common fine roots; common distinct clay films on faces of peds; common fine distinct yellowish brown (10YR 5/4) masses of iron accumulations with diffuse boundaries; moderately acid; clear smooth boundary.

Btg2—18 to 24 inches; dark grayish brown (10YR 4/2) silty clay; moderate fine subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; common fine prominent yellowish brown (10YR 5/6) masses of iron accumulations with diffuse boundaries; slightly acid; gradual smooth boundary.

Btg3—24 to 38 inches; grayish brown (2.5Y 5/2) silty clay; weak medium prismatic structure parting to weak medium subangular blocky; firm; common distinct clay films on faces of peds; common fine distinct yellowish brown (10YR 5/4) masses of iron accumulations with diffuse boundaries; few fine black streaks in cracks and few fine dark concretions (oxides); neutral; gradual smooth boundary.

Btg4—38 to 53 inches; grayish brown (2.5Y 5/2) silty clay loam; weak fine prismatic structure parting to weak fine subangular blocky; firm; few faint clay films on faces of peds; few medium prominent strong brown (7.5YR 5/8) masses of iron accumulations with diffuse boundaries; few fine dark streaks in cracks (oxides); neutral; gradual smooth boundary.

Cg—53 to 72 inches; olive gray (5Y 5/2) silty clay loam; massive; firm; common fine prominent yellowish brown (10YR 5/4) masses of iron accumulations with diffuse boundaries; neutral.

Range in Characteristics

Thickness of the solum: 40 to 72 inches; typically does not contain free carbonates.

Content of sand: Less than 5 percent in the solum

Thickness of the mollic epipedon: 11 to 20 inches

Ap and A horizons:

Value—2 or 3

Chroma—1 or 2

Texture—silt loam, silty clay loam, or silty clay

Reaction—moderately acid to neutral

Bt horizon:

Hue—10YR or 2.5Y (upper part); 10YR to 5Y (lower part); and 5YR to 10YR (iron masses)

Value—3 or 4 (upper part); 4 to 6 (lower part); and 4 or 5 (iron masses)

Chroma—1 to 3 (upper part); 1 or 2 (lower part); and 2 to 6 (iron masses)

Argillic horizon—upper 20 inches averages 42 to 48 percent clay; thin layers (7 inches or less) can range to 50 percent

Reaction—strongly acid to neutral

C horizon:

Hue—10YR to 5Y

Value—4 to 6

Chroma—1 or 2; iron masses have higher chroma

Reaction—slightly acid or neutral

Haig Series

The Haig series consists of deep, poorly drained, slowly or very slowly permeable soils that formed in loess. These soils are on uplands. Slopes range from 0 to 2

percent. The mean annual temperature is about 50 degrees F, and the mean annual precipitation is about 32 inches.

Taxonomic classification: Fine, smectitic, mesic Vertic Argiaquolls

Typical Pedon

Haig silt loam, on a slope of about 1 percent, in a cultivated field about 5 miles south and 2 miles west of Osceola, in Clarke County, Iowa; 415 feet south and 60 feet east of the northwest corner of sec. 13, T. 71 N., R. 26 W. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 7 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.
- A1—7 to 11 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; medium acid; clear smooth boundary.
- A2—11 to 15 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure parting to weak fine granular; friable; few thin discontinuous gray (10YR 5/1) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.
- BA—15 to 19 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine faint yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; firm; few thin discontinuous black (10YR 2/1) clay films in the lower part; few fine dark brown (7.5YR 3/2) accumulations (manganese oxides); medium acid; clear smooth boundary.
- Bt—19 to 24 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; kneaded very dark gray (10YR 3/1) with value slightly higher than 3; common fine distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; very firm; thick continuous black (10YR 2/1) clay films; few fine dark brown (7.5YR 3/2) and dark reddish brown (5YR 2/2) concretions (iron and manganese oxides); medium acid; gradual smooth boundary.
- Btg1—24 to 31 inches; dark gray (5Y 4/1) silty clay; many fine distinct yellowish brown (10YR 5/4) and olive brown (2.5Y 4/4) mottles; weak fine subangular blocky structure; very firm; thick continuous very dark gray (10YR 3/1) clay films; few fine dark brown (7.5YR 3/2) and dark reddish brown (5YR 2/2) concretions (iron and manganese oxides); medium acid; gradual smooth boundary.
- Btg2—31 to 41 inches; olive gray (5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; discontinuous very dark gray (10YR 3/1) and dark gray (10YR 4/1) clay films mainly on prisms; few fine dark brown (7.5YR 3/2) and dark reddish brown (5YR 2/2) concretions (iron and manganese oxides); medium acid; gradual smooth boundary.
- Btg3—41 to 48 inches; light olive gray (5Y 6/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; weak medium prismatic structure; firm; thin discontinuous very dark gray (10YR 3/1) and dark gray (10YR 4/1) clay films on prisms; many fine tubular pores; many fine dark reddish brown (5YR 2/2) and dark brown (7.5YR 3/2) concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.
- BC—48 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure; friable; few discontinuous dark gray (10YR 4/1) clay films on prisms; slightly acid.

Range in Characteristics

Thickness of mollic epipedon: 20 to 35 inches

Depth to the argillic horizon: 24 to 52 inches

Depth to carbonates: More than 60 inches

Depth to redoximorphic concentrations: 14 to 28 inches

Content of clay in the particle-size control section (weighted average): 35 to 50 percent

Content of sand in the particle-size control section (weighted average): Less than 5 percent

Content of rock fragments: None

Other features: In some pedons, there may be a few fine dark brown (7.5YR 3/2) iron-manganese concentrations in the layer above the redoximorphic concentrations.

A horizon:

Hue—10YR or N

Value—2 or 3

Chroma—0 or 1

Texture—silt loam or silty clay loam

Content of clay—22 to 40 percent

Reaction—strongly acid to neutral

BA horizon:

Hue—10YR or N

Value—2 or 3

Chroma—0 or 1

Texture—silty clay loam or silty clay

Content of clay—28 to 48 percent

Reaction—strongly acid to slightly acid

Bt horizon:

Hue—10YR or 2.5Y

Value—3 or 4

Chroma—1

Texture—silty clay or silty clay loam

Content of clay—30 to 48 percent

Reaction—strongly acid to slightly acid

Btg horizon:

Hue—10YR to 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay or silty clay loam

Content of clay—35 to 50 percent

Reaction—strongly acid to neutral

BCg horizon:

Hue—10YR to 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay

Content of clay—40 to 50 percent

Reaction—slightly acid or neutral

Judson Series

The Judson series consists of very deep, well drained soils that formed in silty colluvium derived from noncalcareous loess. These soils are on footslopes, upland drainageways, and alluvial fans. Slopes range from 0 to 12 percent. The mean annual temperature is about 49 degrees F, and the mean annual precipitation is about 30 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Cumulic Hapludolls

Typical Pedon

Judson silty clay loam, on a south-facing slope of 4 percent, in a cultivated field about 7 miles north and 3 miles east of Winterset, in Madison County, Iowa; about 2,000 feet south and 300 feet west of the northeast corner of sec. 33, T. 77 N., R. 27 W., NAD 27. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry, very dark grayish brown (10YR 3/2) kneaded; weak medium granular structure; friable; slightly acid; abrupt smooth boundary.

A1—9 to 15 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry, very dark grayish brown (10YR 3/2) kneaded; weak fine granular and weak very fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

A2—15 to 22 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry, very dark grayish brown (10YR 3/2) kneaded; weak very fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

AB—22 to 28 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry, dark brown (10YR 3/3) kneaded; moderate fine subangular blocky structure; friable; many tubular pores; moderately acid; gradual smooth boundary.

Bt—28 to 35 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry, dark brown (10YR 3/3) kneaded; moderate medium subangular blocky structure; friable; many tubular pores; common very dark grayish brown (10YR 3/2) coatings on faces of peds; very few clay films; slightly acid; gradual smooth boundary.

BC—35 to 52 inches; brown (10YR 4/3) silty clay loam, yellowish brown (10YR 5/4) kneaded; weak coarse subangular blocky structure; friable; many tubular pores; few very dark gray (10YR 3/1) stains on root channels; few fine faint grayish brown (10YR 5/2) redoximorphic depletions; few fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; slightly acid; gradual smooth boundary.

C—52 to 60 inches; brown (10YR 4/3) silty clay loam; massive; friable; few fine dark oxides; few fine faint grayish brown (10YR 5/2) redoximorphic depletions; common fine distinct yellowish brown (10YR 5/6) redoximorphic concentrations; slightly acid.

Range in Characteristics

Depth to carbonates: More than 60 inches

Thickness of the mollic epipedon: 32 to 52 inches

Content of clay in the particle-size control section (weighted average): 30 to 35 percent

Content of sand in the particle-size control section (weighted average): 1 to 10 percent fine and coarser sand

Ap or A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silty clay loam or silt loam

Content of clay—24 to 32 percent

Content of sand—1 to 10 percent

Reaction—moderately acid to neutral

AB horizon:

Hue—10YR

Value—2 or 3

Chroma—2

Texture—silty clay loam

Content of clay—27 to 32 percent
 Content of sand—1 to 10 percent
 Reaction—moderately acid to neutral

Bt or Bw horizon:

Hue—10YR
 Value—3 to 5
 Chroma—3 to 5
 Texture—silty clay loam
 Content of clay—30 to 35 percent
 Content of sand—1 to 10 percent
 Reaction—moderately acid to neutral
 Special features—darker coatings on peds are common; mottles of low or high chroma are as shallow as a depth of 30 inches in some pedons

BC horizon:

Hue—10YR
 Value—3 to 5
 Chroma—3 or 4
 Texture—silty clay loam or silt loam
 Content of clay—25 to 32 percent
 Content of sand—1 to 10 percent
 Reaction—slightly acid to slightly alkaline

C horizon:

Hue—10YR
 Value—3 to 5
 Chroma—3 or 4
 Texture—silty clay loam or silt loam
 Content of clay—25 to 32 percent
 Content of sand—1 to 10 percent
 Reaction—slightly acid to slightly alkaline
 Special features—few or common mottles with chroma of 1 to 6 in some pedons

Kennebec Series

The Kennebec series consists of very deep, moderately well drained soils that formed in dark colored silty alluvium with low content of fine sand or coarse sand. These soils are on flood plains and upland drainageways. Slopes range from 0 to 5 percent. The mean annual air temperature is about 49 degrees F, and the mean annual precipitation is about 30 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Cumulic Hapludolls

Typical Pedon

Kennebec silt loam, on a slope of about 1 percent, in a cultivated area about 7 miles southwest of Dow City, in Crawford County, Iowa; about 2,110 feet north and 62 feet east of the southwest corner of sec. 27, T. 82 N., R. 41 W.; Dunlap NE. USGS quadrangle; lat. 41 degrees 52 minutes 59.5 seconds N. and long. 95 degrees 36 minutes 54.3 seconds W., NAD 83. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 8 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; common fine and very fine roots; few fine and very fine pores; slightly acid; clear smooth boundary.

A1—8 to 18 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry;

- moderate fine subangular blocky structure; friable; common fine and very fine roots; common fine pores; slightly acid; diffuse smooth boundary.
- A2—18 to 32 inches; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry, very dark brown (10YR 2/2) crushed; moderate fine and medium subangular blocky structure; friable; common fine and very fine roots; common fine and medium pores; slightly acid; diffuse smooth boundary.
- A3—32 to 41 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry, very dark brown (10YR 2/2) crushed; weak fine and medium subangular blocky structure; friable; few very fine roots; few fine and medium pores; many large wormholes; slightly acid; diffuse smooth boundary.
- AC—41 to 54 inches; very dark gray (10YR 3/1) silt loam, very dark grayish brown (10YR 3/2) crushed; weak medium subangular blocky structure; friable; few very fine roots; few very fine pores; slightly acid; diffuse smooth boundary.
- C1—54 to 63 inches; very dark grayish brown (10YR 3/2) silt loam; massive; friable; few fine pores; few fine rounded very dark brown (7.5YR 2.5/2) iron and manganese concretions; common medium faint dark brown (10YR 3/3) and common fine distinct dark yellowish brown (10YR 4/4) redoximorphic concentrations; few fine faint grayish brown (10YR 5/2) redoximorphic depletions; slightly acid; diffuse smooth boundary.
- C2—63 to 72 inches; very dark grayish brown (10YR 3/2) silt loam; massive; friable; few fine pores; common fine prominent dark yellowish brown (10YR 4/6) redoximorphic concentrations; slightly acid; diffuse smooth boundary.
- C3—72 to 80 inches; very dark grayish brown (10YR 3/2) silt loam; massive; friable; few fine pores; common fine prominent yellowish brown (10YR 5/6) redoximorphic concentrations; slightly acid.

Range in Characteristics

Depth to carbonates: More than 80 inches

Thickness of the mollic epipedon: More than 40 inches

Content of clay in the particle-size control section (weighted average): 18 to 30 percent

Content of sand in the particle-size control section (weighted average): Less than 10 percent fine and coarser sand

Ap or A horizon:

Hue—10YR; 10YR (overwash)

Value—2 or 3; 3 or 4 (overwash)

Chroma—1 or 2; 1 or 2 (overwash)

Texture—silt loam or silty clay loam; silt loam (overwash)

Content of clay—18 to 30 percent; 18 to 27 percent (overwash)

Content of sand—less than 10 percent; less than 10 percent (overwash)

Reaction—moderately acid to neutral; moderately acid to neutral (overwash)

AB horizon (if it occurs):

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam or silty clay loam

Content of clay—18 to 32 percent

Content of sand—less than 10 percent

Reaction—slightly acid or neutral

AC horizon (if it occurs):

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam or silty clay loam

Content of clay—18 to 32 percent
 Content of sand—less than 10 percent
 Reaction—slightly acid or neutral

Bw horizon (if it occurs):

Hue—10YR or 2.5Y
 Value—2 to 4
 Chroma—2 or 3
 Texture—silt loam or silty clay loam
 Content of clay—24 to 33 percent
 Content of sand—less than 15 percent
 Reaction—slightly acid or neutral
 Special features—iron and manganese concretions, redoximorphic concentrations, and redoximorphic depletions in some pedons

C horizon:

Hue—10YR or 2.5Y
 Value—2 to 4
 Chroma—1 or 2
 Texture—silt loam or silty clay loam
 Content of clay—24 to 30 percent
 Content of sand—less than 15 percent
 Reaction—slightly acid or neutral
 Special features—iron and manganese concretions, redoximorphic concentrations, and redoximorphic depletions in some pedons

Kenridge Series

The Kenridge series consists of very deep, moderately well drained, moderately slowly permeable soils that formed in loamy alluvium. These soils are on flood plains, alluvial fans, and toeslopes. Slopes range from 0 to 2 percent. The mean annual temperature is about 51 degrees F, and the mean annual precipitation is about 29 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Cumulic Hapludolls

Typical Pedon

Kenridge silty clay loam, on a slope of less than 1 percent, in a cultivated field about 1 mile east of Wahoo, in Saunders County, Nebraska; 1,700 feet south and 920 feet west of the northeast corner of sec. 3, T. 14 N., R. 7 E.; Wahoo E. USGS topographic quadrangle; lat. 41 degrees 12 minutes 51 seconds N. and long. 96 degrees 36 minutes 20 seconds W. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; slightly hard, friable; many fine and medium roots; few fine and medium tubular pores; moderately acid; abrupt smooth boundary.
- A—8 to 20 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; slightly hard, friable; few fine and medium roots; common fine tubular pores; moderately acid; clear smooth boundary.
- Bw1—20 to 36 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; few fine roots; few medium tubular pores; continuous pressure faces; faint black (10YR 2/1) coats on faces of peds; neutral; gradual smooth boundary.
- Bw2—36 to 46 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine prominent dark yellowish brown (10YR 4/6) iron masses; strong coarse

prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; few fine roots; few medium tubular pores; continuous pressure faces and dark organic coatings; many rounded soft masses of iron-manganese; neutral; gradual smooth boundary.

Bw3—46 to 60 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; few medium prominent dark yellowish brown (10YR 4/6) iron masses in the matrix; moderate medium prismatic structure parting to moderate medium angular blocky; slightly hard, friable; few fine roots; continuous pressure faces and coats; many soft masses of iron-manganese; neutral; gradual wavy boundary.

BC—60 to 80 inches; dark grayish brown (10YR 4/2) clay loam, gray (10YR 6/1) dry; few fine prominent dark yellowish brown (10YR 4/6) iron masses in the matrix; moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; few fine roots; continuous pressure faces; neutral.

Range in Characteristics

Soil moisture regime: Udic

Depth to secondary calcium carbonate: Free carbonates occur in the solum at a depth of 40 inches or more in some pedons.

Depth to redoximorphic concentrations: 34 to 60 inches

Thickness of the mollic epipedon: From 36 inches to more than 60 inches

Content of clay in the particle-size control section (weighted average): 30 to 35 percent; ranges from 27 to 35 percent

Content of sand in the particle-size control section (weighted average): Less than 30 percent

Other features: Some pedons have a C horizon.

Ap horizon:

Hue—10YR or N

Value—3 moist, 3 or 4 dry

Chroma—0 to 2

Texture—silty clay loam

Content of clay—27 to 35 percent

Reaction—moderately acid or slightly acid

AB horizon (if it occurs):

Hue—10YR

Value—3 moist, 4 dry

Chroma—1 or 2

Texture—silty clay loam

Content of clay—27 to 35 percent

Reaction—moderately acid or slightly acid

Bw horizon:

Hue—10YR

Value—3 or 4 moist, 4 or 5 dry

Chroma—1 or 2

Texture—silty clay loam

Content of clay—27 to 35 percent

Reaction—slightly acid or neutral

BC horizon:

Hue—10YR

Value—3 or 4 moist, 5 or 6 dry

Chroma—1 or 2

Texture—silty clay loam

Content of clay—27 to 35 percent

Reaction—slightly alkaline or moderately alkaline

Kipson Series

The Kipson series consists of shallow and very shallow, moderately permeable soils that formed in residuum derived from calcareous silty shales. These soils are on uplands. They are somewhat excessively drained. Slopes range from 1 to 15 percent but typically range to 70 percent. The mean annual temperature ranges from 52 to 57 degrees F, and the mean annual precipitation ranges from 25 to 33 inches.

Taxonomic classification: Loamy, mixed, superactive, mesic, shallow Udorthentic Haplustolls

Typical Pedon

Kipson silty clay loam, on a slope of 6 percent, in an area of native grassland about 20 miles west of Council Grove, in Morris County, Kansas; 75 feet north and 2,330 feet west of the southeast corner of sec. 29, T. 16 S., R. 5 E. (Colors are for dry soil unless otherwise indicated.)

- A—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate medium and fine granular structure; slightly hard, friable; many fine and very fine roots; strong effervescence; moderately alkaline; clear smooth boundary.
- AC—8 to 13 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, friable; common fine and very fine roots; 10 percent gravel, mostly shale; violent effervescence; moderately alkaline; clear wavy boundary.
- C—13 to 19 inches; yellow (10YR 7/6) and very pale brown (10YR 7/3) channery silty clay loam, brownish yellow (10YR 6/6) and pale brown (10YR 6/3) moist; massive; slightly hard, friable; few fine and very fine roots; roots spread horizontally on contact with Cr horizon; 30 percent gravel, mostly shale; violent effervescence; moderately alkaline; clear smooth boundary.
- Cr—19 to 30 inches; very pale brown (10YR 7/4) and yellow (10YR 7/6) shale and chalky limestone.

Range in Characteristics

Depth to paralithic contact: 6 to 20 inches to silty shale

Depth to secondary calcium carbonate: 0 to 9 inches

Thickness of the mollic epipedon: 6 to 12 inches

Content of clay in the particle-size control section (weighted average): 15 to 35 percent

Content of sand in the particle-size control section (weighted average): 15 to 52 percent

A horizon:

Hue—10YR or 2.5Y

Value—3 to 5 dry, 2 or 3 moist

Chroma—1 or 2, dry or moist

Texture—silt loam or silty clay loam

Content of clay—15 to 35 percent

Reaction—neutral to moderately alkaline

C horizon:

Hue—2.5YR to 2.5Y

Value—5 to 7 dry, 4 to 6 moist

Chroma—2 to 6, dry or moist

Texture—channery silt loam, channery silty clay loam, channery loam, silt loam, silty clay loam, or loam

Content of clay—18 to 35 percent

Content of pararock fragments—0 to 35 percent, by volume

Reaction—moderately alkaline or strongly alkaline

Marshall Series

The Marshall series consists of very deep, well drained soils that formed in loess. These soils are on uplands and high stream benches. Slopes range from 0 to 20 percent. The mean annual temperature is about 50 degrees F, and the mean annual precipitation is about 31 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Typic Hapludolls

Typical Pedon

Marshall silty clay loam (fig. 4), on a west-facing slope of 3 percent, in a cultivated field about 3 miles northwest of Atlantic, in Cass County, Iowa; 829 feet south of the center of the road and 500 feet east of the center of sec. 34, T. 77 N., R. 37 W. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 7 inches; black (10YR 2/1), with chroma slightly more than 1, silty clay loam, very dark brown (10YR 2/2) kneaded, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to weak fine granular; friable; common fine and medium root channels; few very dark grayish brown (10YR 3/2) wormcasts; moderately acid; clear smooth boundary.
- A1—7 to 13 inches; very dark brown (10YR 2/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular and some weak fine subangular blocky structure; friable; common fine and medium root channels; few wormcasts; moderately acid; gradual smooth boundary.
- A2—13 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) with some pale brown (10YR 6/3) peds, dry; weak fine subangular blocky structure; friable; common fine inped tubular pores and few medium root channels; pore fillings and wormcasts of brown (10YR 4/3); moderately acid; clear wavy boundary.
- Bw1—18 to 26 inches; brown (10YR 4/3) silty clay loam, pale brown (10YR 6/3) dry; weak and moderate fine subangular blocky structure; friable; common fine inped tubular pores; some oriented thin discontinuous very dark grayish brown (10YR 3/2) stains on a few peds; few black (10YR 2/1) fills in fine vertical channels; very few very fine soft dark brown concretions (iron oxides); slightly acid; gradual smooth boundary.
- Bw2—26 to 34 inches; brown (10YR 4/3) silty clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; very few light fine faint grayish brown (2.5Y 5/2) mottles in lower part; friable; many fine inped tubular pores; thin discontinuous clay films on some peds; few fine soft dark brown and yellowish brown concretions (iron oxides); slightly acid; clear smooth boundary.
- Bw3—34 to 41 inches; yellowish brown (10YR 5/4) and brown (10YR 4/3) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; common fine faint grayish brown (2.5Y 5/2) and common fine faint yellowish brown (10YR 5/6) mottles with few fine faint brown (7.5YR 4/4) mottles in the lower part; friable; many fine inped tubular pores; thin discontinuous clay films on vertical faces of peds; fine soft dark brown and yellowish brown concretions (iron oxides); slightly acid; gradual smooth boundary.
- Bw4—41 to 47 inches; mottled yellowish brown (10YR 5/4), grayish brown (2.5Y 5/2), and some brown (10YR 4/3) silty clay loam; weak medium prismatic structure

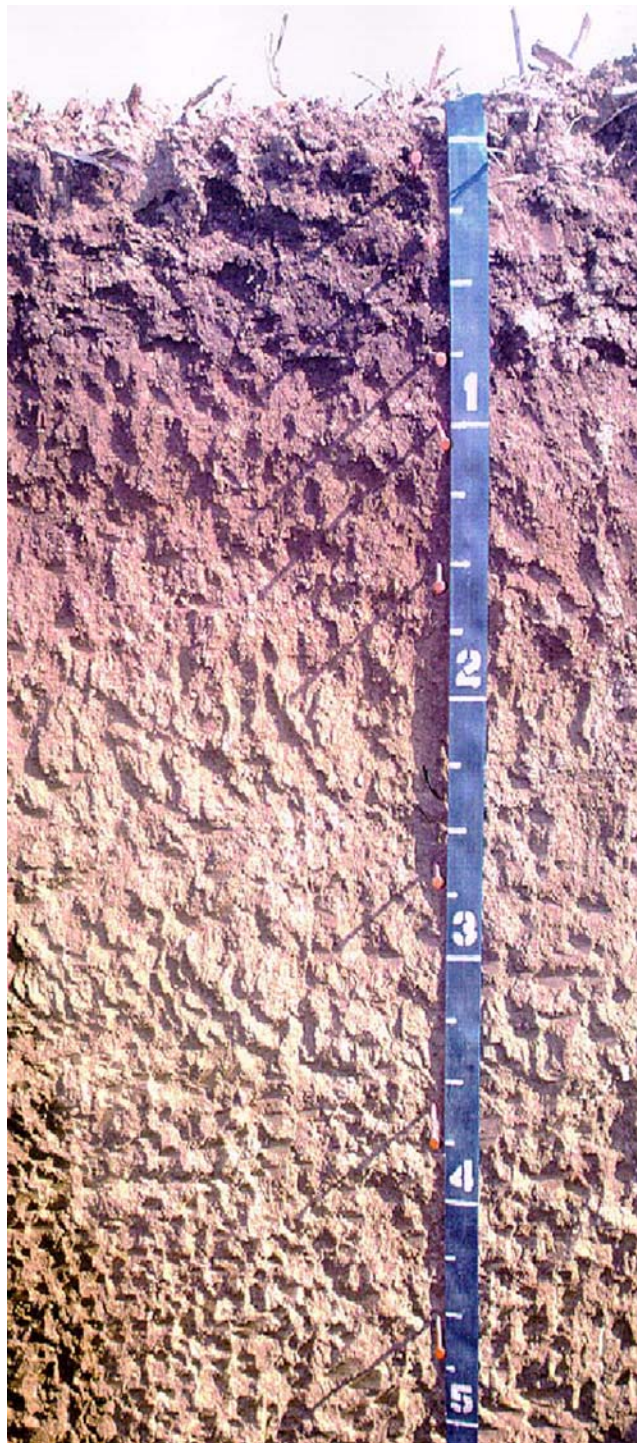


Figure 4.—Profile of Marshall silt loam. Depth is marked in feet.

parting to weak medium subangular blocky; common fine faint yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; friable; many fine and medium inped tubular pores; few thin discontinuous films on some vertical faces; slight increase in grayish brown color in ped interiors; very few very fine soft black concretions (manganese oxides); slightly acid; gradual smooth boundary.

BC—47 to 58 inches; mottled yellowish brown (10YR 5/4) and grayish brown (2.5Y 5/2) silty clay loam with hue slightly yellower than 2.5Y; weak medium and coarse prismatic structure parting to weak medium subangular blocky; common fine faint yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; friable; many fine and medium inped tubular pores; very few very fine soft black concretions (manganese oxides); very few indistinct silt coats on a few vertical faces; slightly acid to neutral; diffuse smooth boundary.

C—58 to 68 inches; mottled yellowish brown (10YR 5/4) and olive gray (5Y 5/2) silty clay loam; massive with some vertical cleavage; friable; many fine and very fine tubular pores; few indistinct silt coats on vertical faces; few fine soft dark brown to black concretions (iron and manganese oxides); mottled oxidized and leached weathering zone; neutral; clear smooth boundary.

Range in Characteristics

Soil moisture regime: Udic

Depth to secondary calcium carbonate: More than 120 inches; ranges to 72 inches

Depth to cambic horizon: 10 to 24 inches

Depth to the horizon with maximum clay content: Decreases with increasing slope gradient

Thickness of the solum: 40 to 70 inches

Thickness of the mollic epipedon: 10 to 24 inches

Particle-size control section (weighted average): Silty clay loam

Content of clay in the particle-size control section (weighted average): 27 to 34 percent

Content of sand in the particle-size control section (weighted average): Less than 10 percent; typically less than 5 percent and mostly very fine in size

Other features: A zone that lacks mottles is immediately below the A horizon and is at least 12 inches thick. Some very thin discontinuous clay films are evident on vertical faces of peds in the Bw horizon, but the B/A clay ratio is only about 1:1. Grayish brown, yellowish brown, strong brown, and brown mottles are in the lower part of the B horizon and in the C horizon and increase in size and abundance with depth. The grayish colors are considered as relict mottles. Soils having dominantly 2 chroma below a depth of 40 inches are within the range of the series.

Ap and A horizons:

Hue—10YR

Value—2 or 3

Chroma—1 or 2 (2 if value of 3)

Texture—silty clay loam or silt loam

Content of clay—25 to 35 percent

Reaction—moderately or slightly acid; some pedons have a neutral Ap horizon

Thickness of the horizon—10 to 24 inches

BA horizon (if it occurs):

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—silty clay loam

Content of clay—27 to 34 percent

Reaction—moderately or slightly acid

Thickness of the horizon—2 to 6 inches

Special features—colors with value of 3 and chroma of 2 are present as coatings on faces of peds below the mollic epipedon in some pedons

Bw horizon:

Hue—10YR

Value—3 or 4 (upper part); 4 or 5 (lower part)

Chroma—3 (upper part); 3 or 4 (lower part)
 Texture—silty clay loam
 Content of clay—30 to 34 percent; ranges to 27 percent
 Reaction—moderately or slightly acid
 Thickness of the horizon—20 to 34 inches

BC and C horizons:

Hue—10YR to 5Y
 Value—4 or 5
 Chroma—2 to 6
 Texture—silt loam or silty clay loam
 Reaction—slightly acid or neutral

Martin Series

The Martin series consists of deep and very deep, moderately well drained, slowly permeable soils that formed in colluvium and/or residuum from interbedded silty and clayey shales, limestone, and clay beds. These soils are on uplands. Slopes range from 0 to 12 percent. The mean annual temperature is 55 degrees F, and the mean annual precipitation is 34 inches.

Taxonomic classification: Fine, smectitic, mesic Aquertic Argiudolls

Typical Pedon

Martin silty clay loam, in a cultivated field about 4.2 miles southwest of Clinton, in Douglas County, Kansas; 1,440 feet north and 1,025 feet west of the southeast corner of sec. 31, T. 14 S., R. 18 E. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 9 inches; very dark brown (10YR 2/2) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; hard, firm, slightly sticky and slightly plastic; slightly acid; gradual smooth boundary.
- BA—9 to 14 inches; very dark brown (10YR 2/2) silty clay loam, dark gray (10YR 4/1) dry; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; most peds have shiny surfaces; medium acid; gradual smooth boundary.
- Bt1—14 to 28 inches; very dark grayish brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; moderate medium and coarse subangular blocky with some angular blocky structure; very hard, very firm, very sticky and very plastic; distinct continuous clay films on faces of peds; few fine distinct yellowish brown (10YR 5/4) masses of iron accumulations; common fine black manganese concretions; many fine wormcasts; many root channels filled with black material; medium acid; gradual smooth boundary.
- Bt2—28 to 37 inches; dark grayish brown (10YR 4/2) silty clay, olive brown (2.5Y 4/4) crushed, grayish brown (10YR 5/2) dry; moderate medium and coarse angular blocky with some subangular blocky structure; very hard, very firm, very sticky and very plastic; distinct and continuous clay films on faces of peds; few fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) masses of iron accumulations; common fine black manganese concretions; wormcasts and root channels as in horizon above; slightly acid; gradual smooth boundary
- BC—37 to 48 inches; grayish brown (10YR 5/2) silty clay, light brownish gray (10YR 6/2) dry; weak coarse and medium angular blocky and subangular blocky structure; very hard, very firm, very sticky and very plastic; clay films on faces of some peds; common coarse prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) masses of iron accumulations; some dark root channels; common fine black manganese concretions; neutral; diffuse boundary.
- C—48 to 80 inches; coarsely mottled gray (10YR 5/1), strong brown (7.5YR 5/6),

yellowish brown (10YR 5/6), and olive brown (2.5Y 4/4) silty clay; light gray (10YR 6/1), reddish yellow (7.5YR 6/6), brownish yellow (10YR 6/6), and light olive brown (2.5Y 5/4) dry; massive; very hard, very firm, very sticky and very plastic; few fine black manganese concretions; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 36 inches; includes the upper part of the argillic horizon

Carbonates: Generally do not have free carbonates; a few small carbonate concretions in the lower part of the B and C horizons in some pedons

Depth to shale or clay beds: More than 40 inches

Other features: A bedrock substratum phase is recognized.

A horizon:

Hue—10YR

Value—2 or 3 moist, 3 or 4 dry

Chroma—1 or 2

Texture—silty clay loam, silty clay, or clay loam

Reaction—moderately acid or slightly acid

Bt horizon:

Hue—10YR or 2.5Y

Value—2 to 4 moist, 3 to 5 dry

Chroma—1 or 2 (upper part); 1 to 4 (lower part)

Texture—clay or silty clay

Content of clay—40 to 55 percent

Reaction—moderately acid to slightly alkaline

Special features—strong brown, reddish brown, and yellowish brown iron accumulations are few and distinct (upper part); common and prominent (lower part)

C horizon:

Hue—5YR to 2.5Y

Texture—clay or silty clay

Reaction—neutral or slightly alkaline

Mayberry Series

The Mayberry series consists of very deep, moderately well drained soils that formed in reworked, weathered glacial till. These soils are on uplands. Permeability is slow or very slow. Slopes range from 2 to 15 percent. The mean annual temperature is 52 degrees F, and the mean annual precipitation is 29 inches at the type location.

Taxonomic classification: Fine, smectitic, mesic Aquertic Argiudolls

Typical Pedon

Mayberry clay loam (fig. 5), on a west-facing slope of 5 percent, in an area of bromegrass about 2 miles east and 1 mile south of Burr, in Otoe County, Nebraska; 1,060 feet north and 60 feet west of the southeast corner of sec. 35, T. 7 N., R. 10 E. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 6 inches; very dark brown (10YR 2/2) clay loam, dark grayish brown (10YR 4/2) dry; weak very fine and fine subangular blocky structure parting to moderate fine granular; friable, hard; moderately acid; clear smooth boundary.

BA—6 to 10 inches; dark brown (7.5YR 3/2) clay loam, brown (7.5YR 5/2) dry;



Figure 5.—Profile of Mayberry clay loam. The dark stains in the upper part of the subsoil are surface material that has moved downward through cracks. This soil has a high shrink-swell potential.

moderate very fine and fine subangular blocky structure; firm, hard; moderately acid; clear smooth boundary.

Bt1—10 to 30 inches; dark reddish brown (5YR 3/4) clay, reddish brown (5YR 4/4) dry; common fine distinct dark red (2.5YR 3/6) and prominent dark grayish brown (10YR

4/2) iron masses in the soil matrix; moderate fine and medium angular blocky structure; very firm, hard; thin discontinuous clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—30 to 43 inches; dark brown (7.5YR 4/4) clay, brown (7.5YR 5/4) dry; few fine distinct reddish brown (5YR 4/4) iron masses in the soil matrix; moderate fine and medium angular blocky structure; very firm, hard; thin discontinuous clay films on faces of peds; common small lime concretions; neutral; gradual wavy boundary.

BC—43 to 60 inches; mottled grayish brown (2.5Y 5/2) and dark brown (7.5YR 4/4) stratified clay and clay loam with thin lenses of silty clay loam, light gray (2.5Y 7/2) and brown (7.5YR 5/4) dry; moderate fine and medium angular blocky structure; very firm, hard; thin discontinuous clay films on faces of peds; neutral; gradual wavy boundary.

C—60 to 80 inches; mottled yellowish brown (10YR 5/4), grayish brown (2.5Y 5/2), and dark reddish brown (5YR 3/4) stratified clay, loam, and sandy loam with thin lenses of silty clay loam; light yellowish brown (10YR 6/4), light gray (10YR 7/2), and dark brown (7.5Y 4/4) dry; massive; some horizontal and vertical angular planes of cleavage; firm, hard; neutral.

Range in Characteristics

Thickness of the solum: 40 to 75 inches

Thickness of the mollic epipedon: 10 to 22 inches; includes the BA horizon and may include the upper part of the Bt horizon; areas in native sod have an A1 horizon that ranges up to 15 inches thick.

Content of sand in the particle-size control section (weighted average): More than 5 percent

Other features: The Bt1 horizon contains 40 to 50 percent clay.

A horizon:

Hue—10YR or 7.5YR

Value—2 or 3 moist, 3 to 5 dry

Chroma—1 to 3

Texture—clay loam, loam, silt loam, or silty clay loam; clay is allowed in places where the soil is eroded

Reaction—moderately acid or slightly acid

BA horizon (if it occurs):

Hue—7.5YR or 10YR

Value—2 to 4, 3 to 5 dry

Chroma—2 to 4

Reaction—moderately acid or slightly acid

Thickness of the horizon—0 to 10 inches

Bt horizon:

Hue 7.5YR or 5YR (upper part); 5YR to 10YR (lower part)

Value—3 to 5 moist, 4 to 6 dry (upper part); 4 or 5 moist, 5 or 6 dry (lower part)

Chroma—2 to 4 moist, 3 to 6 dry (upper part); 2 to 6 (lower part)

Texture—clay or sandy clay

Reaction—moderately acid to neutral (upper part); slightly acid to slightly alkaline (lower part)

Special features—redoximorphic features range from faint to prominent; organic stains and coatings are on the faces of peds with the uncrushed faces of peds being one value darker and one chroma higher than the ped interiors.

BC horizon:

Hue—2.5Y, 10YR, or 7.5YR

Value—4 or 5 moist, 5 to 7 dry

Chroma—2 to 6

Texture—clay or clay loam

Reaction—slightly acid to moderately alkaline

Special features—thin strata of dissimilar material ranging from silty clay loam to sandy loam in some pedons; generally in the lower part

C horizon:

Hue—2.5Y, 10YR, or 7.5YR

Value—4 to 6 moist, 5 to 7 dry

Chroma—2 to 6

Texture—stratified clay, clay loam, silty clay loam, loam, or sandy loam; dominantly clay loam

Content of clay—30 to 40 percent

Reaction—slightly acid to moderately alkaline

Monona Series

The Monona series consists of very deep, well drained soils that formed in loess. These soils are on interfluvial and side slopes on uplands and risers and tread on loess covered stream terraces. Slopes range from 0 to 40 percent. The mean annual air temperature is about 51 degrees F, and the mean annual precipitation is about 29 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Typic Hapludolls

Typical Pedon

Monona silt loam, on a 1 percent slope, in a cultivated field, at an elevation of 1,370 feet above sea level about 7 miles east of Woodbine, in Harrison County, Iowa; about 220 feet north and 1,044 feet east of the southwest corner of sec. 13, T. 80 N., R. 41 W.; Portsmouth USGS topographic quadrangle; lat. 41 degrees 43 minutes 59 seconds N. and long. 95 degrees 34 minutes 22 seconds W., NAD 83. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 7 inches; very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine pores; slightly acid; clear smooth boundary.

A—7 to 15 inches; very dark brown (10YR 2/2) and dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak very fine subangular blocky structure parting to weak very fine granular; friable; few very fine pores; slightly acid; clear smooth boundary.

Bw1—15 to 21 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; common very fine pores; neutral; gradual smooth boundary.

Bw2—21 to 30 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; many very fine pores; few very fine dark concretions (oxides); neutral; gradual smooth boundary.

C—30 to 60 inches; brown (10YR 4/3) silt loam; massive; very friable; few very fine pores; many very fine dark concretions (oxides); common very fine distinct brown (7.5YR 4/4) redoximorphic concentrations; few fine distinct grayish brown (2.5Y 5/2) redoximorphic depletions; neutral grading with depth to slightly alkaline.

Range in Characteristics

Depth to calcium carbonate: 24 to 72 inches

Thickness of the mollic epipedon: 10 to 24 inches

Depth to relict redoximorphic features: 22 to 65 inches

Content of clay in the particle-size control section (weighted average): 20 to 30 percent

Content of sand in the particle-size control section (weighted average): Less than 5 percent

Other features: The thickness of the mollic epipedon, thickness of the cambic horizon, depth to carbonates, and depth to relict redoximorphic features typically decrease as gradients increase on convex slopes; clay content decreases regularly with depth.

A or Ap horizon:

Hue—10YR
Value—2 or 3
Chroma—1 to 3
Texture—silt loam or silty clay loam
Content of clay—20 to 35 percent
Content of sand—less than 5 percent
Reaction—moderately acid to neutral

AB or BA horizon (if it occurs):

Hue—10YR
Value—2 or 3
Chroma—2 or 3
Texture—silt loam or silty clay loam
Content of clay—20 to 30 percent
Content of sand—less than 5 percent
Reaction—slightly acid or neutral
Thickness of the horizon—0 to 6 inches

Bw horizon:

Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam or silty clay loam
Content of clay—20 to 30 percent
Content of sand—less than 5 percent
Reaction—slightly acid or neutral

BC horizon (if it occurs):

Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam
Content of clay—18 to 26 percent
Content of sand—less than 5 percent
Reaction—neutral or slightly alkaline
Thickness of the horizon—0 to 10 inches
Special features—redoximorphic features present in this horizon are believed to be relict and not considered to be related to present day saturation

C horizon:

Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silt loam
Content of clay—18 to 24 percent
Content of sand—less than 5 percent
Calcium carbonate equivalent—0 to 25 percent
Reaction—neutral to moderately alkaline

Special features—redoximorphic features present in this horizon are believed to be relict and not considered to be related to present day saturation; sandy and gravelly sediments within a depth of 60 inches in some pedons

Morrill Series

The Morrill series consists of very deep, well drained soils that formed in loamy glacial till or outwash deposits. These soils are on uplands. Slopes range from 1 to 30 percent. The mean annual precipitation is about 37 inches, and the mean annual temperature is about 53 degrees F.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Argiudolls

Typical Pedon

Morrill loam, in an area of grassland about 5 miles east and 2.5 miles north of Hiawatha, in Brown County, Kansas; 2,475 feet north and 630 feet west of the southeast corner of sec. 7, T. 2 S., R. 18 E. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 4/3) dry; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; 2 percent mixed pebbles; very strongly acid; clear smooth boundary.
- BA—6 to 12 inches; dark brown (10YR 3/3 and 7.5YR 3/4) loam, brown (10YR 4/3) dry; moderate medium granular structure; hard, firm, slightly sticky and slightly plastic; common fine roots; 2 percent mixed pebbles; strongly acid; gradual smooth boundary.
- Bt1—12 to 22 inches; dark reddish brown (5YR 3/4) loam, strong brown (7.5YR 4/6) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine roots; many faint discontinuous clay films on faces of peds; 2 percent mixed pebbles; moderately acid; gradual smooth boundary.
- Bt2—22 to 30 inches; reddish brown (5YR 4/4) sandy clay loam, brown (7.5YR 5/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and slightly plastic; common fine roots; many faint discontinuous clay films on faces of peds; 2 percent mixed pebbles; moderately acid; gradual wavy boundary.
- Bt3—30 to 35 inches; yellowish red (5YR 4/6) and brown (7.5YR 4/4) sandy clay loam, strong brown (7.5YR 5/6) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; common faint patchy clay films on faces of peds; 2 percent mixed pebbles; slightly acid; gradual wavy boundary.
- Bt4—35 to 43 inches; brown (7.5YR 4/4) and strong brown (7.5YR 4/6) sandy clay loam, strong brown (7.5YR 5/6) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few faint patchy clay films on faces of peds; few medium yellowish red (5YR 4/6) relict iron stains; 2 percent mixed pebbles; slightly acid; clear wavy boundary.
- BC—43 to 52 inches; strong brown (7.5YR 4/4) fine sandy loam, reddish yellow (7.5YR 6/6) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; common medium yellowish red (5YR 4/6) relict iron stains; 2 percent mixed pebbles; slightly acid; clear wavy boundary.
- 2C1—52 to 59 inches; strong brown (7.5YR 4/6) fine sandy loam, reddish yellow (7.5YR 6/6) dry; massive; slightly hard, very friable, slightly sticky and nonplastic; many fine yellowish red (5YR 4/6) relict iron stains; 2 percent mixed pebbles; slightly acid; clear wavy boundary.
- 2C2—59 to 73 inches; strong brown (7.5YR 4/6) loamy fine sand, reddish yellow (7.5YR 6/6) dry; single grain; loose, nonsticky and nonplastic; common coarse strong

brown (7.5YR 5/8) and yellowish red (5YR 5/6) relict iron stains; 2 percent mixed pebbles; slightly acid; gradual smooth boundary.

2C3—73 to 80 inches; strong brown (7.5YR 5/6) sand, reddish yellow (7.5YR 6/6) dry; single grain; loose, nonsticky and nonplastic; common coarse and very coarse rounded clay bodies throughout; 2 percent mixed pebbles; slightly acid.

Range in Characteristics

Soil moisture regime: Udic

Depth to argillic horizon: 6 to 23 inches

Thickness of the mollic epipedon: 10 to 20 inches

Thickness of the solum: 30 to 60 inches

Content of clay in the particle-size control section (weighted average): 18 to 35 percent

Content of sand in the particle-size control section (weighted average): More than 20 percent

Other feature: A stony phase is recognized.

A horizon:

Hue—10YR or 7.5YR

Value—2 or 3 moist, 3 to 5 dry

Chroma—1 to 3

Texture—loam, clay loam, stony loam, or very stony loam

Content of clay—15 to 35 percent

Content of rock fragments—0 to 14 percent pebbles, by volume

Reaction—neutral to very strongly acid

Bt horizon:

Hue—7.5YR or 5YR

Value—3 or 4 moist, 4 or 5 dry

Chroma—3 to 6

Texture—loam, clay loam, sandy clay loam, gravelly clay loam, or gravelly sandy clay loam

Content of clay—18 to 35 percent

Content of rock fragments—0 to 20 percent pebbles

Reaction—neutral to very strongly acid

2C or C horizons:

Hue—10YR, 7.5YR, or 5YR

Value—4 or 5 moist, 4 to 6 dry

Chroma—3 to 6

Texture—loam, clay loam, fine sandy loam, sandy loam, sandy clay loam, gravelly loam, gravelly clay loam, gravelly sandy loam, gravelly sandy clay loam, loamy fine sand, or sand; strata of clay in a few pedons

Content of clay—5 to 30 percent

Content of rock fragments—0 to 20 percent pebbles

Reaction—neutral to very strongly acid

Muscotah Series

The Muscotah series consists of very deep, somewhat poorly drained soils that formed in clayey alluvium. These soils are on flood plains. Slopes range from 0 to 2 percent. The mean annual precipitation is about 34 inches, and the mean annual air temperature is about 53 degrees F.

Taxonomic classification: Fine, smectitic, mesic Cumulic Hapludolls

Typical Pedon

Muscotah silty clay loam (fig. 6), in a cultivated field about 4 miles south and 1 mile west of Muscotah, in Brown County, Kansas; 230 feet west and 500 feet north of the southeast corner of sec. 18, T. 4 S., R. 16 E. (Colors are for moist soil unless otherwise indicated.)

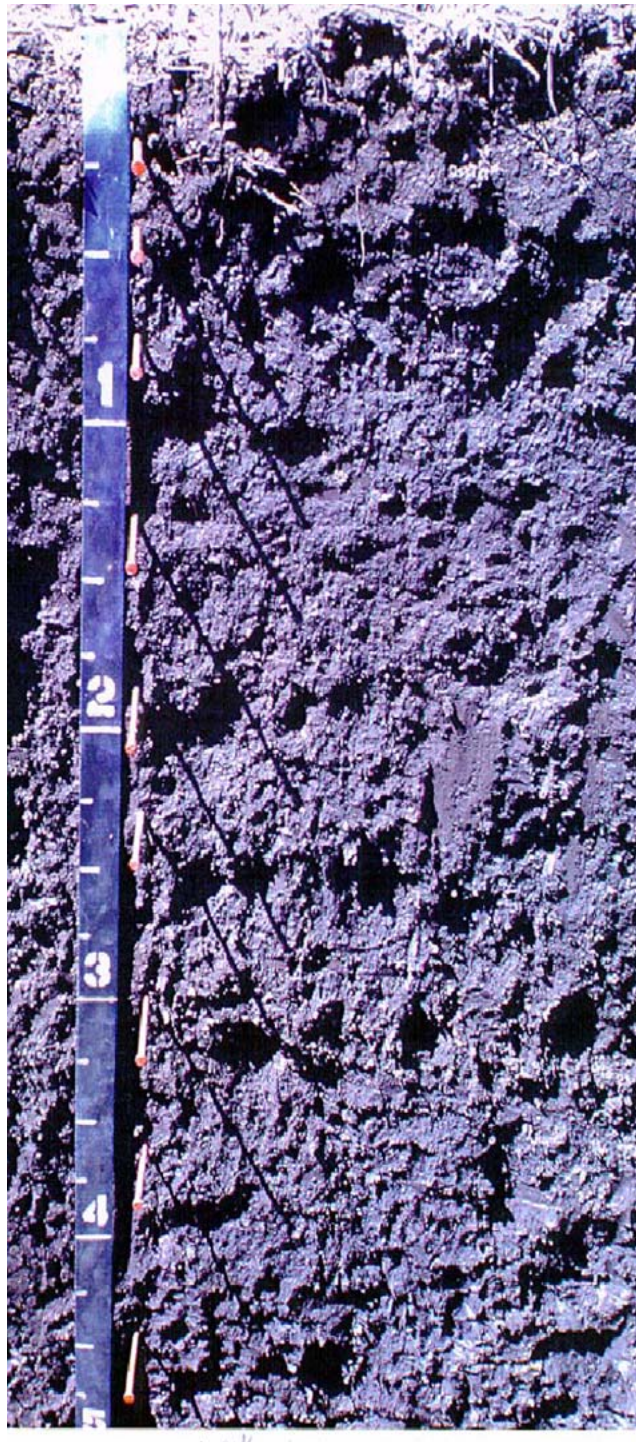


Figure 6.—Profile of Muscotah silty clay loam. This soil is dark to a depth of about 3.5 feet. Depth is marked in feet.

- Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; common fine roots throughout; neutral; clear wavy boundary.
- A1—9 to 16 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots throughout; neutral; gradual smooth boundary.
- A2—16 to 23 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots throughout; few fine prominent yellowish brown (10YR 5/6) soft masses of iron accumulation; neutral; clear smooth boundary.
- Bw1—23 to 35 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots throughout; few distinct slickensides; common fine prominent yellowish brown (10YR 5/6) soft masses of iron accumulation; neutral; gradual smooth boundary.
- Bw2—35 to 44 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct slickensides; common fine distinct dark yellowish brown (10YR 4/4) soft masses of iron accumulation; neutral; gradual smooth boundary.
- Bw3—44 to 60 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct slickensides; few fine rounded iron-manganese concretions; common fine faint very dark grayish brown (10YR 3/2) iron depletions; neutral; gradual wavy boundary.
- Bw4—60 to 70 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common distinct discontinuous intersecting slickensides; few fine rounded iron-manganese concretions and few medium irregular carbonate nodules; common medium distinct dark grayish brown (2.5Y 4/2) iron depletions; neutral; gradual wavy boundary.
- Bg—70 to 80 inches; olive gray (5Y 4/2) silty clay, olive gray (5Y 5/2) dry; weak medium subangular blocky structure; very hard, very firm, very sticky and very plastic; free water at a depth of 75 inches; common distinct discontinuous intersecting slickensides; common fine prominent olive brown (2.5Y 4/4) soft masses of iron accumulation; few fine rounded iron-manganese concretions and common fine and medium irregular carbonate nodules; neutral.

Range in Characteristics

Soil moisture regime: Udic

Depth to secondary calcium carbonate: More than 30 inches

Depth to redoximorphic concentrations: 16 to 24 inches

Thickness of the mollic epipedon: More than 36 inches

Content of clay in the particle-size control section (weighted average): 35 to 50 percent

Content of sand in the particle-size control section (weighted average): Less than 20 percent

Other features: A silty overwash phase is recognized; some pedons have a Cg horizon.

A horizon:

Hue—10YR

Value—2 or 3 moist, 3 or 4 dry

Chroma—1 or 2

Texture—silty clay loam

Content of clay—27 to 40 percent, 18 to 27 percent (silty overwash phase)

Reaction—moderately acid to neutral

Bw horizon:

Hue—10YR or 2.5Y
 Value—2 or 3 moist, 3 to 5 dry
 Chroma—1 or 2
 Texture—silty clay loam or silty clay
 Content of clay—35 to 50 percent
 Content of sand—less than 10 percent
 Reaction—moderately acid to slightly alkaline

Bg horizon:

Hue—2.5Y or 5Y
 Value—2 to 5 moist, 3 to 6 dry
 Chroma—1 or 2
 Content of clay—35 to 50 percent
 Content of sand—less than 10 percent
 Reaction—neutral or slightly alkaline

Netawaka Series

The Netawaka series consists of very deep, well drained and somewhat excessively drained soils that formed in calcareous loess. These soils are on strongly sloping to steep convex shoulders or side slopes on uplands. Permeability is moderate. Slopes range from 10 to 30 percent. The mean annual air temperature is about 54 degrees F, and the mean annual precipitation is about 35 inches.

Taxonomic classification: Coarse-silty, mixed, superactive, calcareous, mesic Typic Udorthents

Typical Pedon

Netawaka silt loam (fig. 7), on an east-facing 10 percent slope, in a cultivated field about 9 miles east and 9 miles north of Hiawatha, in Brown County, Kansas; 150 feet south and 750 feet east of the northwest corner of sec. 12, T. 1 S., R. 18 E. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 6 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; slight effervescence; slightly alkaline; abrupt smooth boundary.
- AC—6 to 9 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; moderate medium platy structure parting to moderate medium angular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine and medium roots between peds; slightly effervescent; slightly alkaline; clear smooth boundary.
- C1—9 to 23 inches; olive brown (2.5Y 4/4) silt loam, light yellowish brown (2.5Y 6/4) dry; common medium and coarse distinct light brownish gray (2.5Y 6/2) and few fine prominent strong brown (7.5YR 5/6) mottles; weak fine and moderate medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; slight effervescence; moderately alkaline; gradual wavy boundary.
- C2—23 to 36 inches; about 50 percent light olive brown (2.5Y 5/4) and about 50 percent grayish brown (2.5Y 5/2) silt loam, light yellowish brown (2.5Y 6/4) and light brownish gray (2.5Y 6/2) dry; few medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; many very fine pores; grays and browns are banded; color bands are tilted somewhat parallel to the surface; few medium wormcasts; slight effervescence; moderately alkaline; gradual wavy boundary.



Figure 7.—Profile of Netawaka silt loam. The yellowish brown colors at a depth of about 2.5 feet are redoximorphic accumulations.

C3—36 to 46 inches; about 50 percent light olive brown (2.5Y 5/4) and about 50 percent grayish brown (2.5Y 5/2) silt loam, light yellowish brown (2.5Y 6/4) and light brownish gray (2.5Y 6/2) dry; few fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and

slightly plastic; few fine and medium roots; slight effervescence; moderately alkaline; clear wavy boundary.

- C4—46 to 61 inches; grayish brown (2.5Y 5/2) silt loam, light brownish gray (2.5Y 6/2) dry; few coarse prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; slight effervescence; slightly alkaline; diffuse boundary.
- C5—61 to 80 inches; grayish brown (2.5Y 5/2) silt loam, light brownish gray (2.5Y 6/2) dry; common medium and coarse prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots throughout; slight effervescence; slightly alkaline.

Range in Characteristics

Calcium carbonate: Throughout most pedons

Content of clay in the particle-size control section (weighted average): 12 to 18 percent; it contains two or more times as much coarse silt as fine silt and less than 10 percent sand.

Calcium carbonate equivalent: Less than 10 percent

A horizon:

Hue—10YR
Value—3 or 4 moist, 4 or 5 dry
Chroma—2 or 3
Reaction—neutral to moderately alkaline

C horizon:

Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Reaction—slightly alkaline or moderately alkaline
Special features—distinct and prominent mottles with shades of brown, gray, and yellow are present but they are not considered diagnostic of this series.

Nodaway Series

The Nodaway series consists of very deep, moderately well drained soils that formed in silty alluvium. These soils are on flood plains, upland drainageways, and alluvial fans. Slopes range from 0 to 5 percent. The mean annual air temperature is about 51 degrees F, and the mean annual precipitation is about 33 inches.

Taxonomic classification: Fine-silty, mixed, superactive, nonacid, mesic Mollic Udifluvents

Typical Pedon

Nodaway silt loam, on a nearly level flood plain, in a cultivated field, at an elevation of 930 feet above sea level about 3 miles east of Sidney, in Fremont County, Iowa; about 150 feet west of the bridge which is 0.5 mile south of the northeast corner of sec. 30, T. 69 N., R. 41 W.; Randolph USGS quadrangle; lat. 40 degrees 45 minutes 01 second N. and long. 95 degrees 35 minutes 41 seconds W., NAD 83. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many roots; neutral; abrupt smooth boundary.
- C—7 to 50 inches; stratified dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), and very dark grayish brown (10YR 3/2) silt loam; massive with weak thin alluvial stratification; friable; few very thin strata of very dark brown (10YR 2/2) silt loam; very

few very thin strata of silty clay loam; numerous wormholes and root channels; few fine faint brown (10YR 4/3) redoximorphic concentrations; neutral.

Range in Characteristics

Depth to buried soil: 36 to more than 60 inches

Content of clay in the particle-size control section (weighted average): 18 to 35 percent

Content of sand in the particle-size control section (weighted average): Less than 15 percent fine and coarser sand

Ap horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam or silty clay loam

Content of clay—18 to 35 percent

Content of sand—less than 15 percent fine or coarser sand

Reaction—slightly acid or neutral

C horizon:

Hue—10YR

Value—2 to 5

Chroma—1 or 2

Texture—silt loam or silty clay loam, commonly stratified; very thin lenses of material coarser than silt loam within a depth of 40 inches in some pedons; sand below a depth of 60 inches in some pedons; silty clay substratum below a depth of 60 inches in some pedons

Content of clay—18 to 35 percent

Content of sand—less than 15 percent fine or coarser sand

Reaction—slightly acid or neutral

Special features—strata with hue of 10YR, value of 4 or 5, and chroma of 2 to 4 in some pedons; dark colored, medium or moderately fine textured buried soils below a depth of 36 inches in some pedons

Olmitz Series

The Olmitz series consists of deep, moderately well drained soils that formed in loamy local alluvium. These soils are on footslopes or alluvial fans. Permeability is moderate. Slopes range from 2 to 14 percent. The mean annual temperature is about 51 degrees F, and the mean annual precipitation is about 32 inches.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Cumulic Hapludolls

Typical Pedon

Olmitz loam, on a southwest-facing slope of 3 percent, in an area of formerly cultivated pasture about 1 mile west and 7 miles north of Patterson, in Madison County, Iowa; 1,940 feet north and 740 feet east of the southwest corner of sec. 30, T. 77 N., R. 26 W. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 7 inches; black (10YR 2/1) loam, very dark brown (10YR 2/2) kneaded, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; moderately acid; clear smooth boundary.

A1—7 to 15 inches; very dark brown (10YR 2/2) clay loam, grayish brown (10YR 5/2) dry; weak very fine and fine subangular blocky and moderate fine granular structure; friable; many wormcasts; common very fine tubular pores and root channels; moderately acid; gradual smooth boundary.

A2—15 to 23 inches; very dark brown (10YR 2/2) clay loam, very dark grayish brown

- (10YR 3/2) kneaded, dark grayish brown to grayish brown (10YR 4/2 and 10YR 5/2) dry; moderate fine and very fine subangular blocky structure; friable; common very fine tubular pores and root channels; moderately acid; gradual smooth boundary.
- A3—23 to 30 inches; very dark grayish brown (10YR 3/2) clay loam, some pedis have very dark brown (10YR 2/2) organic coatings, very dark grayish brown (10YR 3/2) kneaded, dark grayish brown to grayish brown (10YR 4/2 and 10YR 5/2) dry; moderate fine subangular blocky structure with some very fine blocks; friable; common very fine tubular pores and root channels; an occasional gravel-size pebble 2 to 5 mm in diameter; moderately acid; gradual smooth boundary.
- Bw1—30 to 41 inches; dark brown (10YR 3/3) clay loam, some pedis have very dark grayish brown (10YR 3/2) organic coatings, brown (10YR 4/3) kneaded; weak coarse prismatic and weak coarse blocky structure that parts to weak very fine and fine subangular blocky; friable; common very fine tubular pores; a number of gravel-size pebbles 2 to 5 mm in diameter; slightly acid; gradual smooth boundary.
- Bw2—41 to 48 inches; mostly dark brown (10YR 3/3) with some brown (10YR 4/3) clay loam, brown (10YR 4/3) kneaded; few fine faint yellowish brown (10YR 5/6) mottles; weak coarse prismatic and weak coarse blocky structure parting to weak very fine and fine subangular blocky; friable; a few fine dark concretions (oxides); few to common very fine tubular pores; slightly acid; gradual smooth boundary.
- BC—48 to 60 inches; brown (10YR 4/3) clay loam; weak fine subangular blocky structure; friable; common very fine tubular pores; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 40 inches

Depth to redoximorphic concentrations: 41 to 60 inches

Depth to carbonates: More than 60 inches

Depth to glacial till: More than 60 inches

Content of clay in the particle-size control section (weighted average): 28 to 34 percent

Content of sand in the particle-size control section (weighted average): 20 to 50 percent

A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam or clay loam

Content of clay—18 to 34 percent

Content of rock fragments—0 to 5 percent

Reaction—moderately acid to neutral

Special features—up to 18 inches of recently deposited materials in some pedons

Bw horizon:

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—clay loam

Content of clay—22 to 34 percent

Content of rock fragments—0 to 5 percent

Reaction—strongly acid to slightly acid

Special features—redoximorphic concentrations or depletions in the lower portion of the B horizon

BC horizon:

Hue—10YR

Value—4

Chroma—2 or 3
 Texture—loam or clay loam
 Content of clay—22 to 34 percent
 Content of rock fragments—0 to 5 percent
 Reaction—strongly acid to neutral
 Special features—redoximorphic concentrations or depletions in the BC horizon
 Thickness of the horizon—0 to 12 inches

Oska Series

The Oska series consists of moderately deep, well drained soils that formed in residuum derived from limestone. These soils are on uplands. Slopes range from 1 to 9 percent. The mean annual precipitation is about 34 inches, and the mean annual temperature is about 54 degrees F.

Taxonomic classification: Fine, smectitic, mesic Vertic Argiudolls

Typical Pedon

Oska silty clay loam, on a slope of 4 percent, in pastureland about 1.5 miles south and 4.25 miles west of Lawrence, in Douglas County, Kansas; 900 feet south and 2,600 feet west of the northeast corner of sec. 30, T. 13 S., R. 19 E.; Lawrence W. USGS topographic quadrangle; lat. 38 degrees 53 minutes 46 seconds N. and long. 95 degrees 20 minutes 37 seconds W. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 5 inches; dark brown (7.5YR 3/2) silty clay loam, brown (7.5YR 4/2) dry; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots throughout; moderately acid; abrupt smooth boundary.
- BA—5 to 11 inches; dark brown (7.5YR 3/2) silty clay, brown (7.5YR 4/2) dry; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots throughout; moderately acid; clear smooth boundary.
- Bt1—11 to 20 inches; dark brown (7.5YR 3/4) silty clay, brown (7.5YR 4/4) dry; moderate medium subangular blocky structure parting to moderate fine subangular blocky; very hard, firm, very sticky and very plastic; many very fine and fine roots throughout; common very fine tubular pores; few faint discontinuous dark brown (7.5YR 3/3) clay films on faces of peds; 3 percent subangular mixed gravel; moderately acid; clear smooth boundary.
- Bt2—20 to 31 inches; dark reddish brown (5YR 3/4) silty clay, reddish brown (5YR 4/4) dry; strong medium subangular blocky structure parting to strong fine subangular blocky; very hard, firm, very sticky and very plastic; many very fine and fine roots throughout; many very fine tubular pores; many distinct discontinuous dark reddish brown (5YR 3/3) clay films throughout and few prominent discontinuous dark reddish brown (5YR 3/2) organic coats on faces of peds; common fine rounded black (N 2/0) slightly hard iron-manganese concretions between peds; 3 percent subangular mixed gravel and 3 percent subangular mixed cobbles; strongly acid; gradual wavy boundary.
- Bt3—31 to 38 inches; dark reddish brown (5YR 3/4) silty clay, reddish brown (5YR 4/4) dry; strong medium subangular blocky structure parting to strong fine subangular blocky; very hard, firm, very sticky and very plastic; many very fine and fine roots throughout; many very fine tubular pores; many distinct discontinuous dark reddish brown (5YR 3/3) clay films throughout and few prominent discontinuous dark reddish brown (5YR 3/2) organic coats on faces of peds; common fine rounded black (N 2/0) slightly hard iron-manganese concretions between peds; 3 percent

subangular mixed gravel and 3 percent subangular mixed cobbles; moderately acid; gradual wavy boundary.
R—38 inches; limestone bedrock.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 20 inches
Depth to lithic contact: 20 to 40 inches to bedrock
Depth to argillic horizon: 10 to 15 inches
Particle-size control section (weighted average): 41 percent clay
Content of clay in the particle-size control section (weighted average): 35 to 60 percent
Content of sand in the particle-size control section (weighted average): 0 to 10 percent

A horizon:

Hue—10YR or 7.5YR
Value—2 or 3 moist, 4 or 5 dry
Chroma—1 to 3
Texture—silty clay loam or silt loam
Content of clay—20 to 35 percent
Reaction—strongly acid to neutral

BA horizon:

Hue—10YR or 7.5YR
Value—2 or 3 moist, 4 or 5 dry
Chroma—2 or 3
Texture—silty clay loam or silty clay
Content of clay—20 to 50 percent
Reaction—strongly acid to neutral

Bt horizons:

Hue—7.5YR or 5YR
Value—3 to 5 moist, 4 to 6 dry
Chroma—2 to 6
Texture—silty clay or silty clay loam
Content of clay—35 to 50 percent
Reaction—strongly acid to neutral

Otoe Series

The Otoe series consists of very deep, moderately well drained soils that formed in loess over glacial till. These soils are on loess-covered glaciated uplands. Slopes range from 2 to 11 percent. The mean annual temperature is 55 degrees F, and the mean annual precipitation is 33 inches at the type location.

Taxonomic classification: Fine, smectitic, mesic Aquertic Hapludalfs

Typical Pedon

Otoe silty clay loam, on a convex, southwest-facing slope of 8 percent, in a cultivated field about 2 miles south and 3 miles west of Cortland, in Gage County, Nebraska; 2,250 feet south and 1,050 feet east of the northwest corner of sec. 21, T. 6 N., R. 6 E. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 6 inches; silty clay loam, very dark grayish brown (10YR 3/2) crushed, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; hard, friable; common very fine and fine roots throughout; common very fine tubular pores; strongly acid; abrupt smooth boundary.

Bt1—6 to 15 inches; silty clay, 80 percent dark grayish brown (10YR 4/2) crushed, and

- 20 percent brown (10YR 5/3) crushed, grayish brown (10YR 5/2) and pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; very hard, firm; common very fine and fine roots throughout; many very fine tubular pores; continuous clay films on vertical and horizontal faces of peds and common very dark gray (10YR 3/1) organic coats on faces of peds and in pores; few fine irregular yellowish brown (10YR 5/6) soft masses of iron accumulation, few fine and medium rounded light gray (2.5Y 7/2) iron depletions, and few fine rounded masses of iron-manganese concretions; slightly acid; clear smooth boundary.
- Bt2—15 to 22 inches; silty clay, light olive brown (2.5Y 5/3) crushed, light yellowish brown (2.5Y 6/3) dry; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm; common fine roots between peds; many very fine and fine tubular pores; continuous clay films on vertical and horizontal faces of peds and few faint very dark gray (10YR 3/1) organic coats; few fine irregular yellowish brown (10YR 5/6) soft masses of iron accumulation and few fine rounded soft masses of iron-manganese concretions; slightly acid; clear smooth boundary.
- Bt3—22 to 32 inches; silty clay, light olive brown (2.5Y 5/3) crushed, light yellowish brown (2.5Y 6/3) dry; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm; common fine roots in cracks; common fine tubular pores; continuous clay films on vertical and horizontal faces of peds; common fine irregular yellowish brown (10YR 5/6) masses of iron accumulation and common very coarse irregular gray (2.5Y 6/1) iron depletions; slightly acid; gradual wavy boundary.
- BC—32 to 40 inches; silty clay loam, light olive brown (2.5Y 5/3) crushed, light yellowish brown (2.5Y 6/3) dry; moderate medium subangular blocky structure; very hard, firm; common very fine roots in cracks; common fine tubular pores; patchy clay films on faces of peds; many medium and coarse irregular yellowish brown (10YR 5/8) soft masses of iron accumulation and common rounded soft masses of iron manganese concretions; slightly acid; gradual wavy boundary.
- C1—40 to 50 inches; silty clay loam, gray (5Y 5/1) crushed, light gray (2.5Y 7/2) dry; massive; hard, friable; common fine roots in cracks; common fine tubular pores; common medium and coarse irregular yellowish brown (10YR 5/8) soft masses of iron accumulation and few coarse cylindrical iron concretions throughout; neutral; gradual wavy boundary
- C2—50 to 57 inches; silty clay loam, brown (7.5YR 5/2) crushed, pinkish gray (7.5YR 6/2) dry; massive; hard, friable; common very fine roots in cracks; common fine tubular pores; many medium and coarse irregular yellowish brown (10YR 5/8) masses of iron accumulation and common rounded soft masses of iron-manganese concretions; neutral; gradual wavy boundary.
- 2C3—57 to 80 inches; clay loam, brown (7.5YR 4/3) crushed, brown (7.5YR 5/3) dry; massive; hard, friable; common very fine roots in cracks; common fine tubular pores; common fine irregular yellowish brown (10YR 5/6) masses of iron accumulation and common rounded soft masses of iron-manganese concretions; slightly alkaline.

Range in Characteristics

Soil moisture regime: Udic; the soil moisture control section is wet from March through May.

Mean annual soil temperature: 51 to 56 degrees F

Depth to argillic horizon: 3 to 7 inches

Depth to secondary calcium carbonate (if it occurs): 30 to 50 inches

Depth to redoximorphic concentrations: 3 to 7 inches

Depth to redoximorphic depletions: 3 to 7 inches

Depth to episaturation: 12 to 36 inches from March through May

Thickness of the solum: 18 to 53 inches

Vertic features: Linear extensibility of 6.0 cm or more at a depth of 3 to 32 inches.

Content of clay in the particle-size control section (weighted average): 35 to 55 percent

Content of sand in the particle-size control section (weighted average): 1 to 10 percent

Other features: Some pedons have a BC horizon.

A horizon:

Hue—10YR

Value—2 or 3 moist, 3 or 4 dry

Chroma—1 or 2

Texture—silty clay loam or silty clay

Content of clay—35 to 45 percent

Reaction—strongly acid to slightly acid

Bt horizon:

Hue—10YR or 2.5Y

Value—3 to 5 moist, 4 to 6 dry

Chroma—2 to 4

Redoximorphic concentrations—hue of 10YR or 7.5YR, value of 5, and chroma of 6 or 8

Redoximorphic depletions—hue of 10YR or 2.5Y, value of 5 or 6, and chroma of less than 2

Texture—silty clay or silty clay loam

Content of clay—35 to 55 percent

Reaction—moderately acid to neutral

C horizon:

Hue—7.5YR, 2.5Y, or 5Y

Value—5 or 6 moist, 6 or 7 dry

Chroma—1 or 2

Redoximorphic concentrations—hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 6 to 8

Texture—silty clay loam or silt loam

Content of clay—27 to 40 percent

Reaction—slightly acid to moderately alkaline

2C horizon (typically below a depth of 40 inches):

Hue—7.5YR

Value—3 to 5 moist, 4 to 6 dry

Chroma—3 to 6

Redoximorphic concentrations—hue of 10YR, 7.5YR, or 5YR; value of 4 to 6; and chroma of 6 to 8

Texture—clay loam, silty clay loam, or clay

Content of clay—27 to 45 percent

Reaction—neutral or slightly alkaline

Padonia Series

The Padonia series consists of well drained soils that formed in loess. These soils are on uplands. They are moderately deep over clayey alluvium derived from calcareous shale. Slopes range from 3 to 25 percent. The mean annual precipitation is about 34 inches, and the mean annual air temperature is about 53 degrees F.

Taxonomic classification: Fine, mixed, superactive, mesic Typic Argiudolls

Typical Pedon

Padonia silty clay loam, on a slope of 6 percent, in an area of native pasture about 5 miles west and 4 miles north of Morrill, in Brown County, Kansas; 1,250 feet east and 400 feet north of the southwest corner of sec. 6, T. 1 S., R. 15 E. (Colors are for moist soil unless otherwise indicated.)

- A1—0 to 6 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; friable, hard, sticky and plastic; common fine roots throughout; slightly acid; clear smooth boundary.
- A2—6 to 11 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; weak fine subangular blocky structure; firm, very hard, sticky and plastic; common fine roots throughout; neutral; gradual smooth boundary.
- Bt—11 to 22 inches; dark brown (10YR 4/3) silty clay, brown (10YR 5/3) dry; moderate fine subangular blocky structure; very firm, very hard, very sticky and very plastic; few faint continuous clay films; few fine roots throughout; neutral; gradual smooth boundary.
- Btk—22 to 32 inches; 70 percent dark yellowish brown (10YR 4/4) and 30 percent olive gray (5Y 4/2) silty clay, 70 percent yellowish brown (10YR 5/4) and 30 percent olive gray (5Y 5/2) dry; moderate fine subangular blocky structure; very firm, very hard, very sticky and very plastic; few faint continuous clay films; few fine roots throughout; few fine rounded carbonate nodules; slightly alkaline; gradual wavy boundary.
- Bck—32 to 37 inches; olive gray (5Y 5/2) silty clay loam, light olive gray (5Y 6/2) dry; weak fine subangular blocky structure; firm, hard, sticky and plastic; few fine roots throughout; strong effervescence; few fine rounded carbonate nodules; moderately alkaline; gradual wavy boundary.
- Cr—37 inches; light olive gray (5Y 6/2) dry, partially weathered, calcareous shale.

Range in Characteristics

Soil moisture regime: Udic

Depth to paralithic contact: 20 to 40 inches to calcareous shale

Depth to argillic horizon: 6 to 12 inches

Depth to secondary calcium carbonate: 12 to 24 inches

Thickness of the mollic epipedon: 7 to 20 inches

Content of clay in the particle-size control section (weighted average): 35 to 50 percent

Content of sand in the particle-size control section (weighted average): 2 to 15 percent

Other features: Carbonates occur in the form of concretions, films, or threads, but they occur only in the form of concretions at a depth of less than 28 inches. The wide range in color is considered to be inherent of the varicolored shale.

A horizon:

Hue—10YR

Value—2 or 3 moist, 3 to 5 dry

Chroma—1 to 3

Texture—silty clay loam

Content of clay—27 to 40 percent

Reaction—dominantly slightly acid or neutral; slightly acid to strongly acid in areas of cropland

Bt horizon:

Hue—10YR (upper part); 2.5Y or 5Y (lower part)

Value—3 to 5 moist, 4 to 6 dry

Chroma—2 to 6

Texture—silty clay, clay, or silty clay loam

Content of clay—35 to 50 percent
 Reaction—slightly acid to slightly alkaline

Btk horizon:

Hue—2.5Y or 5Y
 Value—3 to 5 moist, 4 to 6 dry
 Chroma—2 to 6
 Texture—silty clay, clay, or silty clay loam
 Content of clay—35 to 50 percent
 Reaction—slightly alkaline or moderately alkaline

BCK horizon (if it occurs):

Hue—2.5Y or 5Y
 Value—4 to 6 moist, 5 to 7 dry
 Chroma—2 to 4, moist or dry
 Texture—silty clay loam
 Content of clay—27 to 40 percent
 Reaction—slightly alkaline or moderately alkaline

Pawnee Series

The Pawnee series consists of very deep, moderately well drained soils that formed in glacial till. These soils are on uplands. Permeability is slow or very slow. Slopes range from 0 to 12 percent. The mean annual precipitation is about 30 inches, and the mean annual temperature is about 54 degrees F.

Taxadjunct features: The Pawnee soils in map unit 7515, Pawnee clay, 7 to 12 percent slopes, eroded, do not meet the range for the series because the surface is eroded. This difference does not significantly affect the use and management of the soils.

Taxonomic classification: Fine, smectitic, mesic Oxyaquic Vertic Argiudolls

Typical Pedon

Pawnee loam (fig. 8), in a cultivated area about 4 miles north of Pawnee City, in Pawnee County, Nebraska; 1,585 feet west and 350 feet south of the northeast corner of sec. 2, T. 2 N., R. 11 E.; Steinauer USGS topographic quadrangle; lat. 40 degrees 10 minutes 27 seconds N. and long. 96 degrees 08 minutes 05 seconds W. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 6 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; moderate fine and very fine granular structure; many fine and medium and few coarse roots throughout; common fine tubular pores; slightly hard, friable; moderately acid; abrupt smooth boundary.
- A—6 to 10 inches; very dark brown (10YR 2/2) clay loam, very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; many fine and medium and few coarse roots throughout; common fine tubular pores; slightly hard, friable; moderately acid; clear smooth boundary.
- BA—10 to 14 inches; dark brown (10YR 3/3) clay loam, dark yellowish brown (10YR 3/4) dry; moderate fine and medium subangular blocky structure; hard, friable; common fine and few medium roots throughout; common fine tubular pores; few fine prominent dark reddish brown (5YR 3/4) iron masses; moderately acid; gradual smooth boundary.
- Bt1—14 to 24 inches; dark grayish brown (10YR 4/2) clay, brown (10YR 4/3) dry; moderate medium and coarse subangular blocky structure; extremely hard, very firm; common fine and few medium roots throughout; common fine tubular pores;

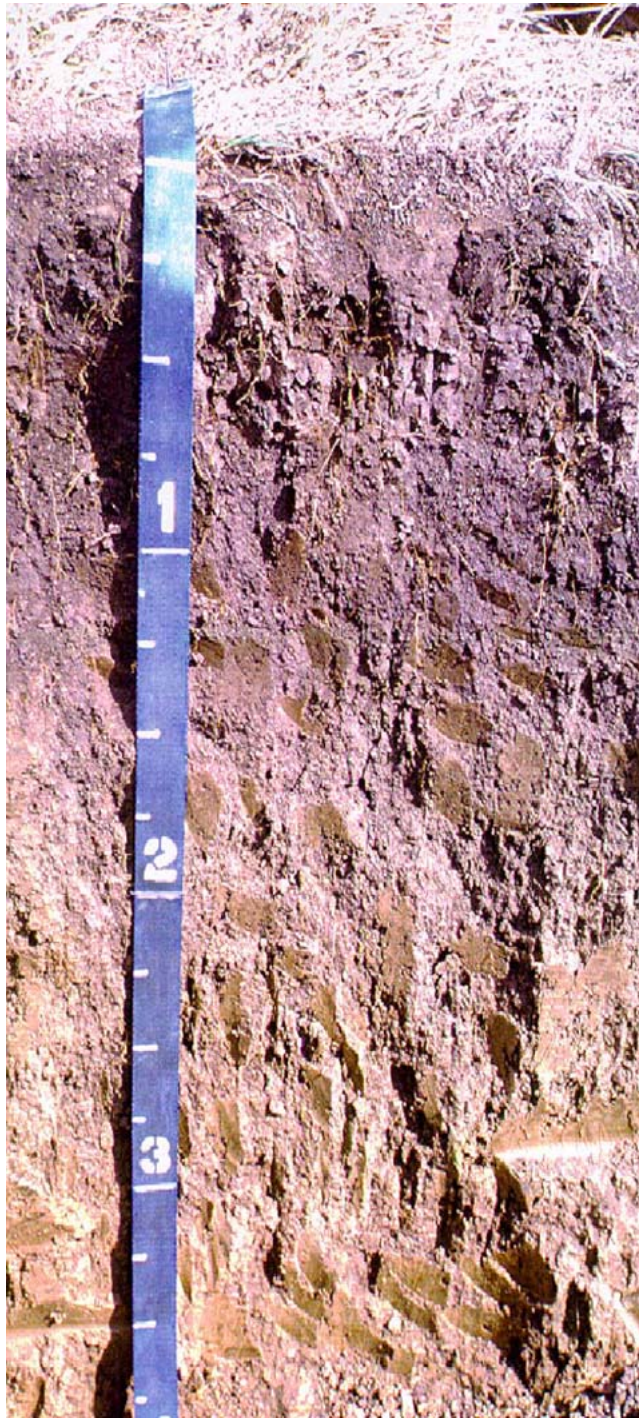


Figure 8.—Profile of Pawnee clay loam. Depth is marked in feet.

thin continuous organic coatings on faces of peds; 2 percent gravel, by volume; few fine and medium prominent reddish brown (5YR 4/4) iron masses; slightly acid; gradual smooth boundary.

Bt2—24 to 32 inches; brown (10YR 4/3) clay, dark yellowish brown (10YR 4/4) dry; weak coarse subangular blocky structure; extremely hard, very firm; few fine and medium roots throughout; few fine tubular pores; thin continuous organic coatings

on faces of peds; 2 percent gravel, by volume; common medium faint grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) and prominent reddish brown (5YR 5/4) iron masses; neutral; gradual smooth boundary.

Bt3—32 to 45 inches; olive brown (2.5Y 4/4) clay, light olive brown (2.5Y 5/4) dry; weak coarse subangular blocky structure; very hard, very firm; few fine and medium roots throughout; few fine tubular pores; thin patchy organic coatings on faces of peds; 2 percent gravel, by volume; many medium distinct grayish brown (10YR 5/2) and prominent brown (7.5YR 5/4) iron masses; moderately alkaline; gradual smooth boundary.

BC—45 to 53 inches; mixed grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) clay, light olive brown (2.5Y 5/4) and dark yellowish brown (10YR 4/4) dry; weak medium subangular blocky structure; very hard, very firm; few fine and medium roots throughout; few fine tubular pores; few medium lime concretions; 2 percent gravel, by volume; many medium prominent dark brown (7.5YR 4/4) iron masses; moderately alkaline; clear smooth boundary.

C—53 to 80 inches; grayish brown (2.5Y 5/2) clay loam, light olive brown (2.5Y 5/4) dry; massive; small iron and manganese concretions; 2 percent gravel, by volume; few medium and large soft masses of lime; many coarse distinct grayish brown (10YR 5/2) iron masses; moderately alkaline.

Range in Characteristics

Soil moisture regime: Udic; the soil moisture control section is wet from March through May.

Mean annual soil temperature: 51 to 56 degrees F

Depth to argillic horizon: 7 to 19 inches

Depth to secondary calcium carbonate: 29 to 54 inches

Depth to redoximorphic concentrations: 7 to 13 inches

Depth to episaturation: 12 to 36 inches from March through May

Thickness of the mollic epipedon: 10 to 19 inches; commonly includes the upper part of the B horizon

Thickness of the solum: 40 to 60 inches

Content of clay in the particle-size control section (weighted average): 40 to 48 percent

Content of sand in the particle-size control section (weighted average): 20 to 45 percent

Content of rock fragments in the particle-size control section (weighted average): 0 to 5 percent, by volume

Size of rock fragments in the particle-size control section: Gravel

Other features: Some pedons have a BA horizon.

A horizon:

Hue—10YR

Value—2 or 3 moist, 3 to 5 dry

Chroma—1 or 2

Texture—loam, clay loam, or clay

Content of clay—15 to 41 percent

Reaction—moderately acid to neutral

Bt horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 5 moist, 3 to 6 dry

Chroma—2 to 4

Redoximorphic concentrations—hue of 7.5YR or 5YR, value of less than 5, and chroma of less than 6

Texture—clay

Content of clay—40 to 48 percent

Content of rock fragments—0 to 5 percent gravel

Reaction—slightly acid to moderately alkaline

BC horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 or 6, moist or dry

Chroma—2 to 6

Redoximorphic concentrations—hue of 7.5YR or 5YR, value of less than 5, and chroma of less than 4

Texture—clay

Content of clay—40 to 48 percent

Content of rock fragments—0 to 5 percent gravel

Reaction—slightly alkaline or moderately alkaline

C horizon:

Hue—10YR, 2.5Y, 5Y, or N

Value—5 moist, 5 or 6 dry

Chroma—0 to 4

Redoximorphic concentrations—hue of 10YR, 7.5YR, or 5YR; value of less than 5; and chroma of less than 4

Texture—clay loam, sandy clay loam, or loam

Content of clay—15 to 40 percent

Content of rock fragments—0 to 5 percent, by volume

Reaction—slightly alkaline or moderately alkaline

Pohocco Series

The Pohocco series consists of very deep, well drained soils that formed in loess. These soils are on uplands. Slopes range from 2 to 30 percent. The mean annual precipitation is about 28 inches, and the mean annual temperature is about 51 degrees F.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Typic Eutrudepts

Typical Pedon

Pohocco silty clay loam, on a slope of 12 percent, in an area of cropland about 4 miles north and 2 miles west of Prague, in Saunders County, Nebraska; 2,325 feet west and 300 feet south of the northeast corner of sec. 16, T. 16 N., R. 5 E.; Prague USGS topographic quadrangle; lat. 41 degrees 21 minutes 52 seconds N. and long. 96 degrees 51 minutes 33 seconds W. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular structure; slightly hard, very friable; many fine roots throughout; common fine and medium tubular pores; neutral; abrupt smooth boundary.

Bw—6 to 15 inches; olive brown (2.5Y 4/4) silt loam, light olive brown (2.5Y 5/4) dry; common fine faint grayish brown (2.5Y 5/2) and few distinct yellowish brown (10YR 5/6) iron masses in the matrix; the matrix color and iron accumulations are relict redoximorphic features; weak coarse subangular blocky structure parting to moderate medium granular; slightly hard, friable; many fine roots throughout; common fine and medium tubular pores; few distinct dark grayish brown (10YR 4/2) continuous organic coats on vertical faces of peds; neutral; clear wavy boundary.

Bk1—15 to 20 inches; olive brown (2.5Y 4/4) silt loam, light yellowish brown (2.5Y 6/4) dry; common fine faint grayish brown (2.5Y 5/2) and few prominent strong brown (7.5YR 5/6) iron masses in the matrix; the matrix color and iron accumulations are

relict redoximorphic features; weak coarse subangular blocky structure parting to moderate medium granular; slightly hard, friable; few fine roots throughout; common fine tubular pores; common fine and medium soft masses of carbonates; violent effervescence; slightly alkaline; gradual smooth boundary.

Bk2—20 to 28 inches; olive brown (2.5Y 4/4) crushed, silt loam, light yellowish brown (2.5Y 6/4) crushed, dry; common medium faint grayish brown (2.5Y 5/2) and few prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure parting to moderate medium granular; friable; few fine roots throughout; common fine tubular pores; few fine rounded soft masses of iron-manganese; fine and medium soft masses of carbonates; violent effervescence; slightly alkaline (7.6); gradual smooth boundary.

C—28 to 60 inches; light olive brown (2.5Y 5/4) silt loam, pale yellow (2.5Y 7/4) dry; common coarse faint light brownish gray (2.5Y 6/2) and few prominent yellowish red (5YR 5/8) iron masses in the matrix; the matrix color and iron accumulations are relict redoximorphic features; massive; slightly hard, friable; few fine roots throughout; common fine tubular pores; common fine rounded soft masses of iron-manganese; few medium soft masses of carbonates and carbonate nodules; violent effervescence; slightly alkaline (7.5).

Range in Characteristics

Soil moisture regime: Udic

Depth to secondary calcium carbonate: 12 to 40 inches

Depth to cambic horizon: 3 to 7 inches

Thickness of the solum: 20 to 46 inches

Content of clay in the particle-size control section (weighted average): 20 to 30 percent

Other features: The matrix color and iron accumulations are relict features and are not indicative of present drainage conditions.

A horizon:

Hue—10YR or 2.5Y

Value—3 or 4 moist, 5 or 6 dry

Chroma—2 to 4

Texture—silty clay loam or silt loam

Content of clay—20 to 35 percent

Reaction—slightly acid to slightly alkaline

Thickness of the horizon—less than 4 inches if mollic colors are present

Bw horizon:

Hue—10YR to 5Y

Value—4 to 6 moist, 5 to 7 dry

Chroma—2 to 4

Texture—silty clay loam or silt loam

Content of clay—20 to 35 percent

Reaction—neutral or slightly alkaline

Bk horizon:

Hue—10YR to 5Y

Value—4 to 6 moist, 5 to 7 dry

Chroma—2 to 4

Texture—silt loam

Content of clay—20 to 27 percent

Calcium carbonate equivalent—0 to 5 percent

Reaction—neutral or slightly alkaline

C horizon:

Hue—7.5YR to 5Y

Value—4 to 6 moist, 5 to 7 dry
 Chroma—2 to 6
 Texture—silt loam
 Content of clay—20 to 27 percent
 Calcium carbonate equivalent—1 to 10 percent
 Reaction—slightly alkaline or moderately alkaline

Reading Series

The Reading series consists of very deep, well drained or moderately well drained soils that formed in silty alluvium. These soils are on flood plain steps and stream terraces. Permeability is moderately slow. The mean annual temperature is 55 degrees F, and the mean annual precipitation is 33 inches.

Taxonomic classification: Fine-silty, mixed, superactive, mesic Pachic Argiudolls

Typical Pedon

Reading silty clay loam, in a cultivated field 0.2 mile east of the Shawnee-Wabaunsee County line on Kansas Highway #4, in Shawnee County, Kansas; 1,200 feet east and 2,540 feet south of the northwest corner of sec. 35, T. 12 S., R. 13 E.; Dover USGS topographic quadrangle; lat. 38 degrees 57 minutes 53 seconds N. and long. 95 degrees 56 minutes 35 seconds W. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; abrupt smooth boundary.
- A—6 to 14 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; moderately acid; gradual smooth boundary.
- Bt1—14 to 22 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; moderate fine subangular blocky and angular blocky structure; hard, firm, sticky and plastic; few distinct patchy continuous clay films on face of peds; moderately acid; gradual smooth boundary.
- Bt2—22 to 40 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 4/3) dry; moderate medium and fine subangular blocky and angular blocky structure; hard, firm, sticky and plastic; common distinct continuous clay films on faces of peds; slightly acid; gradual smooth boundary
- Bt3—40 to 56 inches; dark yellowish brown (10YR 4/4) silty clay loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; hard, firm, sticky and plastic; few distinct patchy clay films on faces of peds; slightly acid; diffuse boundary.
- C—56 to 80 inches; dark yellowish brown (10YR 4/4) silty clay loam, yellowish brown (10YR 5/4) dry; massive; hard, firm, sticky and plastic; neutral.

Range in Characteristics

Depth to argillic horizon: 10 to 20 inches

Depth to calcium carbonate: 40 to 80 inches

Thickness of the mollic epipedon: 16 to 34 inches

Depth to redoximorphic concentrations: 36 to 50 inches; dark yellowish brown iron-manganese concentrations in some pedons

Particle-size control section (weighted average): 14 to 34 inches

Content of clay in the particle-size control section (weighted average): 27 to 35 percent

Other features: Some pedons have a BC horizon.

A horizon:

Hue—10YR
 Value—2 or 3 moist, 4 or 5 dry
 Chroma—1 to 3
 Texture—silt loam or silty clay loam
 Content of clay—20 to 32 percent
 Reaction—moderately acid to neutral

Bt horizon:

Hue—10YR
 Value—2 to 4 moist, 4 to 6 dry
 Chroma—1 to 4
 Texture—silty clay loam
 Content of clay—27 to 35 percent
 Reaction—moderately acid to slightly alkaline

BC horizon:

Hue—10YR
 Value—4 to 6 moist, 5 to 7 dry
 Chroma—2 to 4
 Texture—silt loam or silty clay loam
 Content of clay—18 to 35 percent
 Reaction—moderately acid to slightly alkaline

C horizon:

Hue—10YR
 Value—4 to 6 moist, 5 to 7 dry
 Chroma—1 to 4
 Texture—silt loam or silty clay loam
 Content of clay—18 to 35 percent
 Calcium carbonate equivalent—0 to 5 percent
 Reaction—moderately acid to moderately alkaline

Shelby Series

The Shelby series consists of deep, moderately well drained or well drained soils that formed in glacial till. These soils are on convex side slopes of uplands but are also on narrow interfluvies. Permeability is moderately slow. Slopes range from 1 to 40 percent. The mean annual precipitation is about 32 inches, and the mean annual temperature is about 51 degrees F.

Taxonomic classification: Fine-loamy, mixed, superactive, mesic Typic Argiudolls

Typical Pedon

Shelby clay loam, on a convex slope of 13 percent, in a cultivated field about 6 miles north of Greenfield, in Adair County, Iowa; 1,617 feet east and 2,109 feet south of the northwest corner of sec. 18, T. 76 N., R. 31 W. (All colors are for moist conditions unless otherwise indicated.)

Ap—0 to 7 inches; very dark brown (10YR 2/2) clay loam, black (10YR 2/1) to very dark brown (10YR 2/2) crushed, dark gray (10YR 4/1) dry; weak fine granular structure; friable; medium acid; clear smooth boundary.

AB—7 to 11 inches; very dark grayish brown (10YR 3/2) clay loam, mixed with very

dark brown (10YR 2/2) and dark brown (10YR 3/3), very dark grayish brown (10YR 3/2) crushed; dark grayish brown (10YR 2/2) dry; moderate fine subangular blocky structure; friable; strongly acid; clear smooth boundary.

Bt1—11 to 17 inches; dark brown (10YR 3/3) clay loam mixed with very dark brown (10YR 2/2) along channels; moderate fine and very fine subangular blocky structure; firm; thin continuous clay films; few stones and pebbles; strongly acid; clear smooth boundary.

Bt2—17 to 23 inches; dark yellowish brown (10YR 4/4) clay loam, somewhat mixed with very dark brown (10YR 2/2) along channels in the upper part; moderate fine subangular blocky structure; firm; medium continuous clay films; medium acid; clear smooth boundary.

Bt3—23 to 34 inches; brown (10YR 4/3) clay loam; few stones and pebbles; few fine faint grayish brown (2.5Y 5/2) and a few coarse distinct strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/8) mottles; weak fine and medium blocky structure; firm; medium continuous clay films; medium acid; gradual smooth boundary.

Bt4—34 to 48 inches; brown (10YR 4/3) clay loam; few stones and pebbles; common medium distinct grayish brown (2.5Y 5/2) and a few fine distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse blocky structure; firm; medium discontinuous clay films on vertical faces; slightly acid; clear smooth boundary.

C1—8 to 60 inches; mottled grayish brown (2.5Y 5/2) and dark yellowish brown (10YR 4/4) clay loam; few stones and pebbles; massive; firm; thin discontinuous clay films on vertical faces; common white soft to very hard carbonate nodules less than $\frac{1}{4}$ inch in diameter; strong effervescence; moderately alkaline; gradual smooth boundary.

C2—60 to 72 inches; mottled grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) clay loam; few stones and pebbles; massive; friable; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 20 inches

Depth to carbonates: More than 30 inches

Depth to the argillic horizon: 10 to 18 inches

Content of clay in the particle-size control section (weighted average): 30 to 35 percent

Content of sand in the particle size-control section (weighted average): 20 to 40 percent

Content of rock fragments: 2 to 10 percent

Ap and A horizons:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam, clay loam, or silt loam

Content of clay—24 to 35 percent

Content of sand—20 to 45 percent

Reaction—strongly acid to neutral

AB horizon:

Hue—10YR

Value—2 or 3

Chroma—2 or 3

Texture—loam, clay loam, or silt loam

Content of clay—24 to 35 percent

Content of sand—20 to 45 percent

Reaction—strongly acid to neutral

Bt horizon:

Hue—10YR

Value—3 to 5
 Chroma—3 to 6
 Texture—clay loam
 Content of clay—30 to 38 percent
 Content of sand—20 to 45 percent
 Reaction—strongly acid to neutral

Bk or Btk horizon (if it occurs):

Hue—10YR or 2.5Y
 Value—4 or 5
 Chroma—2 to 6
 Texture—clay loam or loam
 Content of clay—25 to 36 percent
 Content of sand—20 to 45 percent
 Reaction—slightly alkaline or moderately alkaline

BC and C horizons (if they occur):

Hue—10YR or 2.5Y
 Value—4 to 6
 Chroma—2 to 6
 Texture—clay loam, loam, or sandy clay loam
 Content of clay—25 to 36 percent
 Content of sand—30 to 50 percent
 Reaction—neutral to moderately alkaline

Sogn Series

The Sogn series consists of shallow and very shallow, somewhat excessively drained soils that formed in residuum derived from limestone. These soils are on uplands. Slopes range from 0 to 20 percent. The mean annual precipitation is about 32 inches, and the mean annual temperature is about 55 degrees F.

Taxonomic classification: Loamy, mixed, superactive, mesic Lithic Haplustolls

Typical Pedon

Sogn silty clay loam (fig. 9), in an area of rangeland about 10 miles east and 1 mile south of Junction City, in Geary County, Kansas; 300 feet east and 50 feet south of the northwest corner of sec. 15, T. 12 S., R. 7 E. (Colors are for dry soil unless otherwise indicated.)

A—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure; hard, friable; few fragments of weathered limestone in the lower 3 inches making up less than 15 percent of the soil volume; strong effervescence; moderately alkaline; abrupt smooth boundary.

R—9 inches; level-bedded, indurated limestone that has joints averaging about 18 inches apart and less than 1/4 inch wide; cracks are filled with dark colored soil.

Range in Characteristics

Soil moisture regime: Ustic bordering on Udic

Depth to lithic contact: 4 to 20 inches to limestone bedrock

Thickness of the mollic epipedon: 4 to 20 inches

Content of clay in the particle-size control section (weighted average): 20 to 35 percent

Content of sand in the particle-size control section (weighted average): 2 to 35 percent

Content of rock fragments in the particle-size control section (weighted average): Less than 35 percent

Size of rock fragments in the particle-size control section: Pebbles or channers



Figure 9.—Profile of Sogn silty clay loam. Hard bedrock is at a depth of about 15 inches. Depth is marked in feet.

Kind of rock fragments in the particle-size control section: Limestone

Other features: Some pedons do not contain free carbonates above the bedrock; some pedons have an AC or C horizon, which has colors similar to those of the A horizon and is channery silt loam or channery silty clay loam.

A horizon:

Hue—7.5YR to 2.5Y
 Value—3 to 5 dry, 2 or 3 moist
 Chroma—1 to 3, dry or moist
 Texture—silty clay loam, loam, silt loam, or clay loam
 Content of clay—20 to 35 percent
 Content of rock fragments—less than 35 percent
 Reaction—slightly acid to moderately alkaline

Steinauer Series

The Steinauer series consists of very deep, well drained soils that formed in calcareous glacial till. These soils are on uplands. Permeability is moderately slow. Slopes range from 5 to 60 percent. The mean annual temperature is about 52 degrees F, and the mean annual precipitation is about 28 inches.

Taxonomic classification: Fine-loamy, mixed, superactive, calcareous, mesic Typic Udorthents

Typical Pedon

Steinauer clay loam, on a convex, east-facing slope of 9 percent, in a pasture about 3 miles south and 0.5 mile west of Garland, in Seward County, Nebraska; 1,050 feet south and 2,375 feet west of the northeast corner of sec. 29, T. 11 N., R. 4 E.; Garland USGS topographic quadrangle; lat. 40 degrees 53 minutes 54 seconds N. and long. 96 degrees 59 minutes 42 seconds W. When described, the soil was moist to a depth of 41 inches. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to weak medium granular; slightly hard, friable; common fine and medium roots; common fine and medium tubular pores; slight effervescence; slightly alkaline; abrupt smooth boundary.
- AC—6 to 15 inches; gray (10YR 5/1) clay loam, light gray (10YR 6/1) dry; weak coarse and medium subangular blocky structure parting to moderate fine subangular blocky; hard, firm; common fine and medium roots; common fine and medium tubular pores; violent effervescence; moderately alkaline; clear smooth boundary.
- C1—15 to 41 inches; grayish brown (10YR 5/2) clay loam, light brownish gray (10YR 6/2) dry; massive with common medium or strong angular planes of cleavage; hard, firm; few fine roots and tubular pores; many iron and manganese concretions; many fine and medium pockets or seams of soft lime; violent effervescence; many coarse prominent reddish brown (5YR 4/4) iron masses in the matrix, which are relict redoximorphic features; moderately alkaline; diffuse smooth boundary.
- C2—41 to 60 inches; yellowish brown (10YR 5/4) clay loam, light yellowish brown (10YR 6/4) dry; massive with many medium angular planes of cleavage; hard, firm; few fine roots and tubular pores; many iron and manganese concretions; common medium pockets or seams of soft lime; violent effervescence; moderately alkaline.

Range in Characteristics

Soil moisture regime: Udic

Mean annual soil temperature: 49 to 56 degrees F

Depth to secondary calcium carbonate: 0 to 10 inches

Thickness of the solum: 4 to 21 inches

Content of clay in the particle-size control section (weighted average): 24 to 35 percent

Content of sand in the particle-size control section (weighted average): 20 to 52 percent

Content of rock fragments in the particle-size control section (weighted average): 0 to 10 percent, by volume

Size of rock fragments in the particle-size control section: Gravel or cobbles

Kind of rock fragments in the particle-size control section: Mixed

A horizon:

Hue—10YR

Value—2 to 5 moist, 3 to 6 dry

Chroma—1 or 2

Texture—clay loam or loam

Content of clay—16 to 32 percent

Content of rock fragments—0 to 10 percent, by volume

Reaction—slightly alkaline or moderately alkaline

AC horizon (if it occurs):

Hue—10YR or 2.5Y

Value—4 or 5 moist, 5 or 6 dry

Chroma—1 to 4

Texture—clay loam or loam

Content of clay—24 to 35 percent

Reaction—slightly alkaline or moderately alkaline

C horizon:

Hue—10YR or 2.5Y

Value—5 or 6 moist, 6 or 7 dry

Chroma—2 to 4

Texture—clay loam or loam

Content of clay—24 to 35 percent

Content of rock fragments—0 to 10 percent, by volume, gravel, cobbles, or stones

Reaction—slightly alkaline or moderately alkaline

Vinland Series

The Vinland series consists of shallow over shale, somewhat excessively drained soils that formed in residuum derived from interbedded sandy and silty shales. These soils are on uplands. Permeability is moderate. Slopes range from 4 to 30 percent.

Taxonomic classification: Loamy, mixed, superactive, mesic, shallow Typic Hapludolls

Typical Pedon

Vinland silty clay loam, in an area of native grassland about 25 miles southwest of Topeka, in Shawnee County, Kansas; 225 feet west and 2,400 feet north of the southeast corner of sec. 32, T. 13 S., R. 14 E. (Colors are for moist soil unless otherwise indicated.)

A—0 to 6 inches; very dark brown (10YR 2/2) silty clay loam, very dark grayish brown (10YR 3/2) dry; moderate medium and fine granular structure; hard, friable; slightly acid; gradual smooth boundary.

Bw—6 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; hard, friable; few small fragments of shale; slightly acid; gradual smooth boundary.

C—11 to 16 inches; dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) silty clay loam, pale brown (10YR 6/3) and yellowish brown (10YR 5/4) dry; massive; hard, friable; many small shale fragments; slightly acid; clear wavy boundary.

Cr—16 to 24 inches; weathered, interbedded sandy and silty shale.

Range in Characteristics

Thickness of the solum: 10 to 20 inches

Depth to bedrock: 10 to 20 inches

Thickness of the mollic epipedon: 7 to 15 inches

Reaction: Medium acid to mildly alkaline

Texture: Fine sandy loam, loam, silt loam, or silty clay loam

Volume of rock fragments 0 to 3 inches in diameter in the particle-size control section:
0 to 15 percent

A horizon:

Hue—7.5YR or 10YR

Value—2 or 3 moist, 3 to 5 dry

Chroma—1 or 2

Bw horizon:

Hue—7.5YR to 5Y

Value—2 to 5 moist, 3 to 6 dry

Chroma—2 to 4

C horizon:

Hue—7.5YR to 5Y

Value—4 to 7 moist, 5 to 8 dry

Chroma—2 to 4

Texture—fine sandy loam, loam, silt loam, or silty clay loam; includes shaly counterparts

Wabash Series

The Wabash series consists of very deep, poorly and very poorly drained soils that formed in alluvium. These soils are on flood plains. Permeability is very slow. Slopes range from 0 to 2 percent. The mean annual temperature is 53 degrees F, and the mean annual precipitation is 36 inches.

Taxonomic classification: Fine, smectitic, mesic Cumulic Vertic Endoaquolls

Typical Pedon

Wabash silty clay, on a slope of 0.5 percent, in a cultivated field about 4 miles south of Utica on the east side of Missouri State Highway "C", in Livingston County, Missouri; 2,620 feet south and 20 feet east of the northwest corner of sec. 7, T. 56 N., R. 24 W. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 6 inches; very dark brown (10YR 2/2) silty clay, dark grayish brown (10YR 4/2) dry; weak and moderate fine granular structure; firm; few fine faint dark gray (10YR 4/1) iron depletions; few fine black concretions (oxides); moderately acid; abrupt smooth boundary.

A1—6 to 9 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; strong fine and medium subangular blocky structure; firm; few fine faint dark gray (10YR 4/1) iron depletions; few fine black concretions (oxides); moderately acid; clear smooth boundary.

A2—9 to 19 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; very firm; few pressure faces; few fine distinct dark yellowish brown (10YR 4/4) iron masses; many fine concretions (oxides); slightly acid; gradual smooth boundary.

Bg1—19 to 38 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; some large spots and streaks of dark gray (5Y 4/1); moderate fine subangular blocky structure; very firm; common pressure faces; common coarse distinct dark

yellowish brown (10YR 4/4) iron masses; many fine concretions (oxides); some exteriors of pedis are very dark gray (N 3/0); slightly acid; diffuse smooth boundary. Bg2—38 to 60 inches; dark gray (N 4/0) silty clay; large spots and streaks of gray (5Y 4/1); weak fine subangular blocky structure; common pressure faces; extremely firm; many fine concretions (oxides); slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 36 to 44 inches

Depth to carbonates: More than 40 inches

Depth to redoximorphic concentrations: 0 to 9 inches

Content of clay in the particle-size control section (weighted average): 40 to 60 percent

Content of sand in the particle size-control section (weighted average): Less than 15 percent

Content of rock fragments: None

A horizon:

Hue—10YR to 5Y or N

Value—2 or 3

Chroma—0 to 2

Texture—silty clay or clay

Content of clay—40 to 60 percent

Content of sand—less than 5 percent

Reaction—strongly acid to neutral

Overwash phase of A horizon:

Hue—10YR to 5Y

Value—2 or 3

Chroma—1 or 2

Texture—silt loam or silty clay loam

Content of clay—20 to 40 percent

Content of sand—5 to 20 percent

Reaction—strongly acid to neutral

Thickness of the horizon—6 to 20 inches

Bg horizon:

Hue—10YR to 5Y or N

Value—2 to 5

Chroma—0 to 2

Texture—silty clay or clay

Content of clay—40 to 60 percent

Content of sand—less than 15 percent

Reaction—strongly acid to neutral

Cg horizon (if it occurs):

Hue—10YR to 5Y or N

Value—2 to 5

Chroma—0 to 2

Texture—silty clay or clay

Content of clay—40 to 60 percent

Content of sand—less than 15 percent

Reaction—strongly acid to slightly alkaline

Wamego Series

The Wamego series consists of moderately deep, well drained soils that formed in residuum from interbedded sandy and silty shale. These soils are on uplands.

Permeability is slow. Slopes range from 3 to 25 percent. The mean annual temperature is 55 degrees F, and the mean annual precipitation is 32 inches.

Taxonomic classification: Fine, mixed, superactive, mesic Typic Argiudolls

Typical Pedon

Wamego silt loam (fig. 10), on a slope of 8 percent, in an area of native grass about 10 miles east of Westmoreland, in Pottawatomie County, Kansas; about 1,100 feet east and 400 feet south of the northwest corner of sec. 5, T. 8 S., R. 11 E. (Colors are for moist soil unless otherwise indicated.)

- A—0 to 6 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; moderate very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; slightly acid; clear smooth boundary.
- AB—6 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; slightly acid; clear smooth boundary.
- Bt1—10 to 17 inches; dark brown (10YR 4/3) silty clay loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; hard, friable; some faces of peds are very dark grayish brown (10YR 3/2); few faint clay films on ped faces; 5 percent gravel, mostly sandstone; common fine roots; slightly acid; gradual smooth boundary.
- Bt2—17 to 27 inches; yellowish brown (10YR 5/4) silty clay loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; hard, friable; some faces of peds are dark brown (10YR 4/3); common fine faint clay films on ped faces; 10 percent gravel, mostly sandstone and shale; few fine roots; slightly acid; clear smooth boundary.
- Cr—27 to 48 inches; pale brown and yellowish brown shale.

Range in Characteristics

Depth to paralithic contact: 20 to 40 inches to shale bedrock

Thickness of the mollic epipedon: 7 to 18 inches

Content of shale and sandstone gravel 2 mm to 3 inches long in the particle-size control section: 0 to 15 percent

Other features: Fine mica flakes are common throughout many pedons. Some pedons have a BC horizon with color and texture similar to the Bt horizon.

A horizon:

Hue—7.5YR or 10YR

Value—2 or 3 moist, 3 to 5 dry

Chroma—1 or 2

Texture—silt loam or silty clay loam

Reaction—moderately acid or slightly acid

Bt horizon:

Hue—5YR to 2.5Y

Value—3 to 5 moist, 4 to 6 dry

Chroma—2 to 4

Texture—silty clay loam, clay loam, or silty clay

Content of clay—35 to 42 percent

Reaction—moderately acid to neutral

Content of rock fragments—0 to 35 percent shale and sandstone gravel

Wymore Series

The Wymore series consists of very deep, moderately well drained soils that formed in loess. These soils are on uplands. Permeability is slow or very slow. Slopes range



Figure 10.—Profile of Wamego silty clay loam. Paralithic contact is at a depth of about 2 feet.

from 0 to 9 percent. The mean annual temperature is 55 degrees F, and the mean annual precipitation is 33 inches near the type location.

Taxonomic classification: Fine, smectitic, mesic Aquertic Argiudolls

Typical Pedon

Wymore silty clay loam, on a convex, southwest-facing slope of 4 percent, in a cultivated field about 1 mile east and 1 mile south of Pawnee City, in Pawnee County, Nebraska; 1,170 feet west and 580 feet south of the northeast corner of sec. 1, T. 1 N., R. 11 E. When described, the soil was moist throughout. (Colors are for moist soil unless otherwise indicated.)

- Ap—0 to 5 inches; very dark brown (10YR 2/2) silty clay loam, dark gray (10YR 4/1) dry; weak medium granular structure; slightly hard, friable; moderately acid; abrupt smooth boundary.
- BA—5 to 9 inches; very dark brown (10YR 2/2) silty clay, very dark grayish brown (10YR 3/2) dry; moderate very fine subangular blocky structure; hard, firm; thin continuous clay films on faces of peds; moderately acid; clear smooth boundary.
- Bt1—9 to 17 inches; very dark grayish brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; moderate medium and fine subangular blocky structure; hard, firm; thin continuous clay films on faces of peds; moderately acid; clear smooth boundary.
- Bt2—17 to 25 inches; dark grayish brown (10YR 4/2) silty clay, dark yellowish brown (10YR 4/4) dry; moderate medium and fine subangular blocky structure; hard, firm; thin continuous clay films on faces of peds; few fine distinct reddish brown (5YR 5/4) and dark yellowish brown (10YR 4/4) iron masses; slightly acid; gradual smooth boundary.
- Bt3—25 to 32 inches; grayish brown (2.5Y 5/2) silty clay, brown (10YR 5/3) dry; moderate medium subangular blocky structure; hard, firm; thin continuous clay films on faces of peds; common fine distinct dark yellowish brown (10YR 4/4) iron masses; slightly acid; clear smooth boundary.
- BC—32 to 40 inches; mixed olive brown (2.5Y 4/4) and grayish brown (2.5Y 5/2) silty clay loam, grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) dry; moderate medium and fine subangular blocky structure; slightly hard, friable; thin discontinuous clay films on faces of peds; common fine reddish brown (5YR 4/4) iron and manganese concretions; few fine distinct yellowish brown (10YR 5/4) iron masses; neutral; clear smooth boundary.
- C—40 to 53 inches; gray (5Y 5/1) silty clay loam, light brownish gray (2.5Y 6/2) dry; weak medium and coarse subangular blocky structure; slightly hard, friable; few fine pipelike iron concretions; few lime concretions; neutral; abrupt smooth lower boundary.
- Ab—53 to 63 inches; dark brown (7.5YR 4/2) silty clay loam, brown (10YR 5/3) dry; weak thin platy structure; soft, very friable; neutral.

Range in Characteristics

Soil moisture regime: Udic; the soil moisture control section is wet from March through April.

Mean annual soil temperature: 50 to 59 degrees F

Depth to argillic horizon: 4 to 15 inches

Depth to secondary calcium carbonate (if it occurs): 30 to 50 inches

Depth to redoximorphic concentrations: 12 to 24 inches

Depth to episaturation: 12 to 36 inches from March through April

Thickness of the mollic epipedon: 10 to 24 inches

Thickness of the solum: 33 to 80 inches

Vertic features: Linear extensibility of 6.0 cm or more at a depth of 4 to 39 inches

Content of clay in the particle-size control section (weighted average): 42 to 55 percent

Content of sand in the particle-size control section (weighted average): 0 to 5 percent

Other features: Redoximorphic features in the form of iron masses and iron and manganese concretions with hue of 5YR, 7.5YR, or 10YR; value of 2 to 5; and

chroma of 1 to 8 are in the lower part of the particle-size control section and underlying layers.

A horizon:

Hue—10YR
Value—2 or 3 moist, 3 or 4 dry
Chroma—1 or 2
Texture—silty clay loam or silty clay
Content of clay—27 to 50 percent
Reaction—moderately acid or slightly acid

Bt horizon:

Hue—10YR or 2.5Y
Value—3 to 5 moist, 4 to 6 dry
Chroma—2 to 4
Texture—silty clay
Content of clay—42 to 55 percent
Reaction—moderately acid to neutral
Special features—redoximorphic features are not evident or are masked by the matrix color in the lower part of the Bt horizon in some pedons

C horizon:

Hue—2.5Y or 5Y
Value—5 or 6 moist, 6 or 7 dry
Chroma—1 or 2
Texture—silty clay loam
Content of clay—27 to 40 percent
Reaction—neutral or slightly alkaline

Zook Series

The Zook series consists of very deep, poorly drained soils that formed in alluvium. These soils are on flood plains, upland drainageways, and stream terraces. Slopes range from 0 to 5 percent. The mean annual temperature is about 49 degrees F, and the mean annual precipitation is about 31 inches.

Taxonomic classification: Fine, smectitic, mesic Cumulic Vertic Endoaquolls

Typical Pedon

Zook silty clay loam, on a slope of less than 1 percent, in a cultivated field, at an elevation of 1,150 feet above sea level about 5 miles west of Atlantic, in Cass County, Iowa; about 2,040 feet east and 210 feet north of the southwest corner of sec. 5, T. 76 N., R. 37 W.; Walnut USGS topographic quadrangle; lat. 41 degrees 23 minutes 46 seconds N. and long. 95 degrees 07 minutes 44 seconds W., NAD 83. (Colors are for moist soil unless otherwise indicated.)

Ap—0 to 6 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular and weak fine subangular blocky structure; friable; slightly compact at 6 inches; many fine roots; moderately acid; clear smooth boundary.

A1—6 to 14 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate very fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

A2—14 to 20 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; friable; sheen on faces of peds; slightly acid; gradual smooth boundary.

A3—20 to 38 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry;

faces of peds black (10YR 2/1); moderate medium subangular blocky structure; firm; sheen on faces of peds; slightly acid; gradual smooth boundary.

Bg—38 to 52 inches; dark gray (5Y 4/1) and very dark gray (10YR 3/1) silty clay; moderate medium subangular blocky structure; firm; sheen on faces of peds; few fine dark concretions; slightly acid; gradual smooth boundary.

Cg—52 to 60 inches; dark gray (5Y 4/1) silty clay in the upper part, gray (5Y 5/1) in the lower part; massive, some vertical cleavage; firm; few dark concretions; slightly acid.

Range in Characteristics

Thickness of the mollic epipedon: 36 to more than 60 inches

Depth to redoximorphic concentrations: 24 to 60 inches

Depth to carbonates: 60 to more than 80 inches

Content of clay in the particle-size control section (weighted average): 35 to 44 percent

Content of sand in the particle-size control section (weighted average): 0 to 15 percent fine and coarser sand

Other features: These soils do not have stratification above a depth of 4 feet.

Ap and A horizons:

Hue—10YR or N; 10YR (overwash)

Value—2 or 3; 2 or 3 (overwash)

Chroma—0 or 1; 1 or 2 (overwash)

Texture—silty clay loam or silty clay; silt loam (overwash)

Content of clay—32 to 45 percent; 20 to 26 percent (overwash)

Content of sand—less than 15 percent; 5 to 20 percent (overwash)

Reaction—moderately acid to slightly alkaline

Thickness of the horizon—6 to 18 inches (overwash)

Special features—matrix value of 3 or lower extends to a depth of more than 36 inches

Bg horizon:

Hue—10YR to 5Y

Value—2 to 5

Chroma—1

Texture—silty clay loam or silty clay

Content of clay—36 to 45 percent

Content of sand—less than 15 percent

Reaction—slightly acid or neutral

Cg horizon:

Hue—10YR to 5Y

Value—2 to 5

Chroma—1

Texture—silty clay loam, silty clay, or silt loam

Content of clay—20 to 45 percent

Content of sand—less than 15 percent

Reaction—slightly acid or neutral

Formation of the Soils

This section relates the soils in the survey area to the major factors of soil formation.

Factors of Soil Formation

Soil-forming processes act on deposited or accumulated geologic material. The characteristics of the soil at any given place are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material accumulated and has existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material. Each of these factors affects the formation of every soil, and each modifies the effects of the other four factors. The effects of each vary from location to location.

Parent Material

Parent material is the consolidated material in which soils form. It forms as rocks are broken down by chemical weathering and by physical weathering, which involves freezing and thawing, wind action, and the grinding action of rivers and glaciers. In part of the county, glacial action increased the rate of weathering by scouring and grinding the rock. Wind action has also greatly influenced the type of parent material in which the soils formed.

Parent material influences the kind of soil that forms and the rate of formation. Many chemical and physical properties of the soils are inherited from the parent material.

The parent materials in Brown County are residuum derived from limestone and shale, glacial sediments, alluvial sediments, and loess.

About 7 percent of the soils in the survey area formed in material weathered from interbedded limestone and shale of the Upper Pennsylvanian period. In the southeastern and south-central parts of the county, the Wabaunsee Group, which consists of the shallow Kipson, Sogn, and Vinland soils, occurs along moderately sloping to moderately steep areas adjacent to intermittent streams. In the western one-third of the county, the Council Grove Group, which consists of the moderately deep Padonia, Oska, and Wamego soils and the deep Martin soils, occurs in moderately sloping to moderately steep areas along intermittent streams.

About 21 percent of the soils in the county formed in outwash from the Kansas glacial till. These are the very deep Burchard, Mayberry, Morrill, Olmitz, Pawnee, Shelby, and Steinauer soils. Except for the Steinauer soils, all of these soils are leached of lime to a depth of about 30 inches. The till contains various amounts of gravel- and sand-sized fragments of granite and quartz and various other rocks. Till can be found in all but the northeastern part of the county.

About 13 percent of the soils in the county formed in alluvial sediments on flood plains along the rivers and their tributaries. These sediments are silty or clayey. Along the Delaware and Wolf Rivers and Roys Creek and Walnut Creek, the Chase, Muscotah, and Wabash soils formed in clayey alluvium. Kennebec, Nodaway, and Reading soils formed in silty alluvium along the smaller tributaries.

About 59 percent of the soils in the county formed in loess. The loess is more than 100 feet thick near the Missouri River in the northeastern part of the county. It thins out and is more clayey with increasing distance from the Missouri River. The Contrary, Monona, Netawaka, and Pohocco soils formed in deep, silty loess in the northeastern part of the county, near the Missouri River. The Aksarben, Grundy, Judson, Marshall, and Wymore soils formed in silty loess that is more clayey than the other loess soils. They are considerably farther from the Missouri River.

Climate

Climate influences both the physical and chemical weathering processes and the biological forces at work in the soil material. Temperature affects the decomposition of the organic matter, the growth of organisms, and the rate of chemical reaction in the soils. If the supply of moisture is adequate, the soil-forming process becomes more active as the soil temperature increases. These processes are limited by inadequate or excessive moisture.

The soils in Brown County formed under a moist, humid or subhumid climate. Summers are hot, and winters are moderately cold. The average annual precipitation is about 35 inches.

The moderate amount of precipitation in the county has favored the growth of tall grasses. The downward movement of water is one of the main factors affecting the transformation of loess into a soil that has distinctive horizons. As water moves through the soil, calcium carbonate and salts are leached from the upper part of the soil and either form a lower horizon of enrichment or are carried out of the soil profile entirely. Also, the translocation of clay is partly caused by the downward movement of water.

Plant and Animal Life

Plants and animals furnish organic matter to the soil and transport soil and plant material from one layer to another. Organic matter creates a favorable environment for biological activity within the soil by providing food for micro-organisms. These organisms affect the chemical, physical, and biological processes of soil formation.

Most of the soils in Brown County formed under tall prairie grasses. These grasses added much organic matter to the soils, darkened the upper layers, and strengthened soil structure.

Relief

Relief influences soil formation through its effect on runoff, drainage, erosion, soil temperature, and plant cover. The amount of water that enters the soil depends partly on topography. In areas of moderately steep soils, such as Shelby soils, the loss of water through runoff and the continuous removal of surface soil slow down the rate of soil formation. The rate of soil formation is more rapid in the moderately sloping to strongly sloping Martin soils, which are dark to a greater depth than the Shelby soils. The rate of soil formation is most rapid in the nearly level to gently sloping soils, such as Wymore soils.

Time

The length of time that is needed for the formation of a soil depends mainly on the other factors of soil formation. Soils form slowly if the climate is dry and the vegetation is sparse, but they form much more rapidly if the climate is moist and the vegetation is dense.

Some soils in Brown County do not have distinct horizons because they have not been subject to the processes of soil formation for a long enough period. The moderately steep Shelby soils constantly lose soil material. As a result, they show minimal evidence of horizon differentiation. Nodaway soils have weakly expressed horizons because they formed in recently deposited alluvial sediments. The nearly level and gently sloping Aksarben soils have been in place long enough to have developed well defined, genetically related horizons.

References

- American Association of State Highway and Transportation Officials (AASHTO). 2000. Standard specifications for highway materials and methods of sampling and testing. 19th edition, 2 volumes.
- American Society for Testing and Materials (ASTM). 2001. Standard classification of soils for engineering purposes. ASTM Standard D 2487.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service, U.S. Department of Agriculture Handbook 18.
- Soil Survey Staff. 1998. Keys to soil taxonomy. 8th edition. U.S. Department of Agriculture, Natural Resources Conservation Service
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436.
- United States Department of Agriculture. 1960. Soil survey of Brown County, Kansas. Soil Conservation Service.
- United States Department of Agriculture. 1961. Land capability classification. Soil Conservation Service, U.S. Department of Agriculture Handbook 210.
- United States Department of Agriculture. 1981. Land resource regions and major land resource areas of the United States. Soil Conservation Service, U.S. Department of Agriculture Handbook 296.
- United States Department of Agriculture, Soil Conservation Service. National forestry manual. (Available in the State office of the Natural Resources Conservation Service at Salina, Kansas)

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between

particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with baseexchange capacity but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

- Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.
- Corrosion.** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.
- Cover crop.** A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.
- Cropping system.** Growing crops according to a planned system of rotation and management practices.
- Crop residue management.** Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.
- Crown.** The upper part of a tree or shrub, including the living branches and their foliage.
- Cutbanks cave** (in tables). The walls of excavations tend to cave in or slough.
- Decreasers.** The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.
- Deferred grazing.** Postponing grazing or resting grazing land for a prescribed period.
- Depth, soil.** Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.
- Depth to rock** (in tables). Bedrock is too near the surface for the specified use.
- Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.
- Drainage class** (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained*. These classes are defined in the “Soil Survey Manual.”
- Drainage, surface.** Runoff, or surface flow of water, from an area.
- Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.
- Endosaturation.** A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.
- Eolian soil material.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.
- Episaturation.** A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.
- Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
- Erosion** (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
- Erosion** (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.
- Fallow.** Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain

is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above

surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide

because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across.

Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes.

Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size.

Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as “saturated hydraulic conductivity,” which is defined in the “Soil Survey Manual.” In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as “permeability.” Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural

grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water.

Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, the slope classes are as follows:

Nearly level	0 to 2 percent
Gently sloping	1 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 17 percent
Moderately steep	17 to 30 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and

ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Tables

Table 1.--Temperature and Precipitation
(Recorded in the period 1961-90 at Horton, Kansas)

Month	Temperature						Precipitation				
				2 years in 10 will have--		Average	2 years in 10 will have--			Average	
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	number of growing degree days*	Average	Less than--	More than--	number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	36.6	14.7	25.7	64	-16	14	0.94	0.46	1.55	2	4.2
February----	42.5	19.6	31.1	73	-12	39	1.01	.40	1.58	2	4.4
March-----	55.0	30.8	42.9	84	1	188	2.37	.80	3.66	4	3.5
April-----	68.0	42.4	55.2	90	18	463	3.18	1.77	4.43	5	.8
May-----	77.4	52.5	65.0	92	32	773	4.84	2.75	6.69	7	.0
June-----	86.1	62.0	74.0	100	44	1,020	5.62	2.97	7.94	7	.0
July-----	91.1	66.8	79.0	103	51	1,207	3.67	1.47	5.53	6	.0
August-----	88.9	64.2	76.6	103	48	1,134	4.13	1.88	6.06	6	.0
September---	80.7	56.0	68.3	97	34	850	4.50	1.77	6.80	6	.0
October-----	69.8	44.0	56.9	90	23	525	2.99	.89	4.69	4	.2
November----	53.7	31.8	42.8	77	8	165	1.82	.65	3.01	3	.8
December----	40.0	19.6	29.8	68	-12	26	1.28	.50	1.92	2	3.3
Yearly:											
Average---	65.8	42.0	53.9	---	---	---	---	---	---	---	---
Extreme---	---	---	---	105	-19	---	---	---	---	---	---
Total-----	---	---	---	---	---	6,405	36.35	28.53	43.70	54	17.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall
(Recorded in the period 1961-90 at Horton, Kansas)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 13	Apr. 25	May 5
2 years in 10 later than--	Apr. 8	Apr. 19	May 1
5 years in 10 later than--	Mar. 28	Apr. 10	Apr. 22
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 20	Oct. 10	Sept. 28
2 years in 10 earlier than--	Oct. 24	Oct. 15	Oct. 2
5 years in 10 earlier than--	Nov. 2	Oct. 24	Oct. 10

Table 3.--Growing Season
(Recorded in the period 1961-90 at Horton, Kansas)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	183	172	152
8 years in 10	191	178	158
5 years in 10	206	191	170
2 years in 10	221	204	181
1 year in 10	229	211	187

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
4350	Chase silty clay loam, rarely flooded-----	3,220	0.9
4725	Kipson-Sogn complex, 5 to 30 percent slopes-----	3,114	0.9
4832	Wamego silty clay loam, 3 to 7 percent slopes-----	4,353	1.2
4834	Wamego-Vinland silty clay loams, 3 to 15 percent slopes-----	5,026	1.4
7050	Kennebec silt loam, occasionally flooded-----	24,363	6.7
7051	Kennebec silt loam, frequently flooded-----	4,725	1.3
7060	Muscotah silt loam, overwash, occasionally flooded-----	1,413	0.4
7061	Muscotah silty clay loam, occasionally flooded-----	6,388	1.7
7091	Wabash silty clay, occasionally flooded-----	231	*
7171	Reading silt loam, moderately wet, rarely flooded-----	1,067	0.3
7205	Aksarben silty clay loam, 0 to 2 percent slopes-----	166	*
7206	Aksarben silty clay loam, 2 to 5 percent slopes-----	15,289	4.2
7207	Aksarben silty clay loam, 5 to 11 percent slopes-----	30,403	8.3
7220	Burchard clay loam, 6 to 12 percent slopes-----	1,710	0.5
7225	Burchard-Steinauer clay loams, 12 to 18 percent slopes-----	1,629	0.4
7255	Grundy silt loam, 0 to 1 percent slopes-----	2,775	0.8
7290	Marshall silt loam, 2 to 5 percent slopes-----	10,734	2.9
7293	Marshall silty clay loam, 5 to 9 percent slopes-----	20,926	5.7
7301	Martin silty clay loam, 1 to 3 percent slopes-----	900	0.2
7303	Martin silty clay loam, 3 to 7 percent slopes, eroded-----	130	*
7304	Martin silty clay loam, 7 to 12 percent slopes-----	15	*
7415	Mayberry clay loam, 3 to 7 percent slopes-----	1,867	0.5
7436	Morrill loam, 7 to 12 percent slopes, eroded-----	23,756	6.5
7455	Olmitz loam, 1 to 5 percent slopes-----	1,287	0.4
7470	Padonia-Martin silty clay loams, 5 to 9 percent slopes-----	11,190	3.1
7471	Padonia-Martin silty clay loams, 9 to 25 percent slopes-----	2,753	0.8
7473	Padonia-Oska silty clay loams, 5 to 9 percent slopes-----	656	0.2
7500	Pawnee clay loam, 1 to 3 percent slopes-----	85	*
7502	Pawnee clay loam, 3 to 7 percent slopes-----	580	0.2
7504	Pawnee clay loam, 7 to 12 percent slopes-----	37,679	10.3
7510	Pawnee clay, 3 to 7 percent slopes, eroded-----	1,060	0.3
7515	Pawnee clay, 7 to 12 percent slopes, eroded-----	2,307	0.6
7585	Shelby clay loam, 7 to 12 percent slopes-----	6,153	1.7
7587	Shelby clay loam, 12 to 18 percent slopes, eroded-----	1,534	0.4
7681	Wymore silty clay loam, 1 to 3 percent slopes-----	56,877	15.5
7683	Wymore silty clay loam, 3 to 6 percent slopes-----	68,019	18.6
7688	Wymore-Baileyville complex, 3 to 6 percent slopes, eroded-----	625	0.2
7750	Nodaway silt loam, occasionally flooded-----	1,472	0.4
7851	Judson silt loam, 1 to 5 percent slopes-----	2,719	0.7
7920	Contrary silty clay loam, 5 to 9 percent slopes-----	569	0.2
7965	Monona silt loam, 2 to 5 percent slopes-----	442	0.1
7966	Monona silt loam, 5 to 11 percent slopes, eroded-----	2,477	0.7
7981	Pohocco-Netawaka silt loams, 11 to 17 percent slopes, eroded-----	2,364	0.6
7982	Pohocco-Netawaka silt loams, 17 to 30 percent slopes-----	177	*
9971	Arents, earthen dam-----	29	*
9981	Gravel pits and quarries-----	107	*
9986	Miscellaneous water-----	3	*
9999	Water-----	870	0.2
	Total-----	366,234	100.0

* Less than 0.1 percent.

Table 5.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name.)

Map symbol	Map unit name
4350	Chase silty clay loam, rarely flooded
4832	Wamego silty clay loam, 3 to 7 percent slopes
7050	Kennebec silt loam, occasionally flooded
7060	Muscotah silt loam, overwash, occasionally flooded
7061	Muscotah silty clay loam, occasionally flooded
7091	Wabash silty clay, occasionally flooded (where drained)
7171	Reading silt loam, moderately wet, rarely flooded
7205	Aksarben silty clay loam, 0 to 2 percent slopes
7206	Aksarben silty clay loam, 2 to 5 percent slopes
7255	Grundy silt loam, 0 to 1 percent slopes
7290	Marshall silt loam, 2 to 5 percent slopes
7301	Martin silty clay loam, 1 to 3 percent slopes
7415	Mayberry clay loam, 3 to 7 percent slopes
7455	Olmitz loam, 1 to 5 percent slopes
7500	Pawnee clay loam, 1 to 3 percent slopes
7502	Pawnee clay loam, 3 to 7 percent slopes
7681	Wymore silty clay loam, 1 to 3 percent slopes
7683	Wymore silty clay loam, 3 to 6 percent slopes
7750	Nodaway silt loam, occasionally flooded
7851	Judson silt loam, 1 to 5 percent slopes
7965	Monona silt loam, 2 to 5 percent slopes

Table 6.--Land Capability and Yields per Acre of Crops

(Yields are those that can be expected under a high level of management. They are for nonirrigated areas. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Grain sorghum	Soybeans	Winter wheat
		Tons	Bu	Bu	Bu	Bu
4350: Chase-----	2w	5.4	134	99	38	43
4725: Kipson-----	6e	---	---	---	---	---
Sogn-----	6s	---	---	---	---	---
4832: Wamego-----	4e	3.9	97	71	27	32
4834: Wamego-----	6e	---	58	45	20	---
Vinland-----	6e	---	---	---	---	---
7050: Kennebec-----	2w	6.0	150	110	43	49
7051: Kennebec, frequently flooded-----	5w	---	---	---	---	---
7060: Muscotah-----	2w	4.7	134	99	38	39
7061: Muscotah-----	2w	4.4	126	92	36	36
7091: Wabash-----	3w	3.4	97	71	28	28
7171: Reading-----	1	5.9	150	111	43	49
7205: Aksarben-----	1	6.0	150	110	43	48
7206: Aksarben-----	2e	5.8	146	107	42	47
7207: Aksarben-----	3e	5.6	142	104	41	45
7220: Burchard-----	3e	4.7	120	88	35	38
7225: Burchard-----	6e	---	---	---	---	---
Steinauer-----	6e	---	---	---	---	---
7255: Grundy-----	2e	5.5	138	102	39	45
7290: Marshall-----	2e	6.2	156	114	45	51

Table 6.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Grain sorghum	Soybeans	Winter wheat
		Tons	Bu	Bu	Bu	Bu
7293: Marshall-----	3e	6.1	153	112	44	50
7301: Martin-----	2e	5.3	131	97	38	43
7303: Martin-----	4e	5.2	128	95	37	42
7304: Martin-----	4e	5.2	128	95	37	42
7415: Mayberry-----	3e	4.5	112	83	32	36
7436: Morrill, eroded-----	4e	4.8	122	90	35	40
7455: Olmitz-----	2e	5.5	139	102	40	46
7470: Padonia-----	4e	4.2	95	71	27	31
Martin-----	4e	5.2	128	95	37	42
7471: Padonia-----	6e	---	---	---	---	---
Martin-----	4e	5.2	128	95	37	42
7473: Padonia-----	4e	4.2	95	71	27	31
Oska-----	3e	3.2	92	69	26	30
7500: Pawnee-----	2e	---	---	62	---	34
7502: Pawnee-----	3e	4.8	122	90	35	40
7504: Pawnee-----	4e	4.6	117	87	34	39
7510: Pawnee, eroded-----	4e	---	---	50	---	28
7515: Pawnee, eroded-----	4e	4.3	109	81	30	35
7585: Shelby-----	3e	5.0	128	95	38	42
7587: Shelby, eroded-----	4e	4.7	120	88	35	40
7681: Wymore-----	2e	---	---	66	---	37
7683: Wymore-----	3e	5.7	142	104	40	47

Table 6.--Land Capability and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Alfalfa hay	Corn	Grain sorghum	Soybeans	Winter wheat
		Tons	Bu	Bu	Bu	Bu
7688:						
Wymore-----	3e	---	---	66	---	37
Baileyville-----	3e	---	---	60	---	33
7750:						
Nodaway-----	2w	5.7	142	104	41	47
7851:						
Judson-----	2e	6.1	154	113	44	51
7920:						
Contrary-----	3e	5.7	142	104	41	46
7965:						
Monona-----	2e	6.1	152	112	44	51
7966:						
Monona, eroded-----	3e	5.8	146	107	42	48
7981:						
Pohocco, eroded-----	4e	5.2	130	95	38	42
Netawaka-----	4e	4.8	115	84	33	37
7982:						
Pohocco-----	6e	---	---	---	---	---
Netawaka-----	6e	---	---	---	---	---
9971.						
Arents, earthen dam						
9983.						
Gravel pits and quarries						
9986.						
Miscellaneous water						
9999.						
Water						

Table 7.--General Crop Production Index

(See text for an explanation of the ratings in this table.)

Map symbol	Soil name	Crop index
4350	Chase silty clay loam, rarely flooded-----	72
4725	Kipson-Sogn complex, 5 to 30 percent slopes-----	72
4832	Wamego silty clay loam, 3 to 7 percent slopes-----	64
4834	Wamego-Vinland silty clay loams, 3 to 15 percent slopes-----	68
7050	Kennebec silt loam, occasionally flooded-----	68
7051	Kennebec silt loam, frequently flooded-----	77
7060	Muscotah silt loam, overwash, occasionally flooded-----	78
7061	Muscotah silty clay loam, occasionally flooded-----	75
7091	Wabash silty clay, occasionally flooded-----	80
7171	Reading silt loam, moderately wet, rarely flooded-----	53
7205	Aksarben silty clay loam, 0 to 2 percent slopes-----	45
7206	Aksarben silty clay loam, 2 to 5 percent slopes-----	51
7207	Aksarben silty clay loam, 5 to 11 percent slopes-----	57
7220	Burchard clay loam, 6 to 12 percent slopes-----	49
7225	Burchard-Steinauer clay loams, 12 to 18 percent slopes-----	72
7255	Grundy silt loam, 0 to 1 percent slopes-----	81
7290	Marshall silt loam, 2 to 5 percent slopes-----	40
7293	Marshall silty clay loam, 5 to 9 percent slopes-----	48
7301	Martin silty clay loam, 1 to 3 percent slopes-----	72
7303	Martin silty clay loam, 3 to 7 percent slopes, eroded-----	72
7303	Martin silty clay loam, 7 to 12 percent slopes-----	78
7415	Mayberry clay loam, 3 to 7 percent slopes-----	81
7436	Morrill loam, 7 to 12 percent slopes, eroded-----	61
7455	Olmitz loam, 1 to 5 percent slopes-----	55
7470	Padonia-Martin silty clay loams, 5 to 9 percent slopes-----	69
7471	Padonia-Martin silty clay loams, 9 to 25 percent slopes-----	77
7473	Padonia-Oska silty clay loams, 5 to 9 percent slopes-----	69
7500	Pawnee clay loam, 1 to 3 percent slopes-----	71
7502	Pawnee clay loam, 3 to 7 percent slopes-----	80
7504	Pawnee clay loam, 7 to 12 percent slopes-----	80
7510	Pawnee clay, 3 to 7 percent slopes, eroded-----	71
7515	Pawnee clay, 7 to 12 percent slopes, eroded-----	80
7585	Shelby clay loam, 7 to 12 percent slopes-----	80
7587	Shelby clay loam, 12 to 18 percent slopes, eroded-----	54
7681	Wymore silty clay loam, 1 to 3 percent slopes-----	74
7683	Wymore silty clay loam, 3 to 6 percent slopes-----	72
7688	Wymore-Baileyville complex, 3 to 6 percent slopes, eroded-----	81
7750	Nodaway silt loam, occasionally flooded-----	67
7851	Judson silt loam, 1 to 5 percent slopes-----	40
7920	Contrary silty clay loam, 5 to 9 percent slopes-----	46
7965	Monona silt loam, 2 to 5 percent slopes-----	38
7966	Monona silt loam, 5 to 11 percent slopes, eroded-----	48
7981	Pohocco-Netawaka silt loams, 11 to 17 percent slopes, eroded-----	81
7982	Pohocco-Netawaka silt loams, 17 to 30 percent slopes-----	81
9971	Arents, earthen dam-----	6
9983	Gravel pits and quarries-----	6
9986	Miscellaneous water-----	6
9999	Water-----	6

Table 8.--Rangeland Productivity and Characteristic Plant Communities

(Only the soils that support rangeland vegetation suitable for grazing are rated.)

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland compo- sition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
4350: Chase-----	Loamy Lowland (pe30-37)	9,000	7,000	6,000	big bluestem----- yellow Indiangrass----- eastern gamagrass----- prairie cordgrass----- switchgrass----- Canada wildrye----- Florida paspalum----- longstem spikesedge----- marsh muhly----- tall dropseed----- Virginia wildrye----- yellow bristlegrass-----	40 25 15 10 10 5 5 5 5 5 5 5
4725: Kipson-----	Limy Upland (pe30-37)	4,500	3,900	3,400	big bluestem----- little bluestem----- sideoats grama----- switchgrass----- yellow Indiangrass-----	35 25 10 10 10
Sogn-----	Shallow Limy (pe30-37)	3,500	2,500	1,500	sideoats grama----- little bluestem----- big bluestem----- switchgrass----- yellow Indiangrass-----	30 15 10 10 10
4832: Wamego-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem----- yellow Indiangrass----- little bluestem----- switchgrass----- eastern gamagrass-----	40 20 15 15 10
4834: Wamego-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem----- yellow Indiangrass----- little bluestem----- switchgrass----- eastern gamagrass-----	40 20 15 15 10
Vinland-----	Shallow Savannah (pe30-37)	4,500	3,900	3,400	little bluestem----- big bluestem----- blackjack oak----- post oak----- yellow Indiangrass----- switchgrass-----	30 25 10 10 10 5

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland compo- sition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
7050:						
Kennebec-----	Loamy Lowland (pe30-37)	9,000	7,000	6,000	big bluestem-----	40
					yellow Indiangrass-----	25
					eastern gamagrass-----	15
					prairie cordgrass-----	10
					switchgrass-----	10
					Canada wildrye-----	5
					Florida paspalum-----	5
					longstem spikeseedge-----	5
					marsh muhly-----	5
					tall dropseed-----	5
					Virginia wildrye-----	5
					yellow bristlegrass-----	5
7051:						
Kennebec-----	Loamy Lowland (pe30-37)	8,500	6,700	5,700	big bluestem-----	40
					yellow Indiangrass-----	25
					eastern gamagrass-----	15
					prairie cordgrass-----	10
					switchgrass-----	10
					Canada wildrye-----	5
					Florida paspalum-----	5
					longstem spikeseedge-----	5
					marsh muhly-----	5
					tall dropseed-----	5
					Virginia wildrye-----	5
					yellow bristlegrass-----	5
7060:						
Muscotah-----	Loamy Lowland (pe30-37)	9,000	7,000	6,000	big bluestem-----	40
					yellow Indiangrass-----	25
					eastern gamagrass-----	15
					prairie cordgrass-----	10
					switchgrass-----	10
					Canada wildrye-----	5
					Florida paspalum-----	5
					longstem spikeseedge-----	5
					marsh muhly-----	5
					tall dropseed-----	5
					Virginia wildrye-----	5
					yellow bristlegrass-----	5
7061:						
Muscotah-----	Loamy Lowland (pe30-37)	9,000	7,000	6,000	big bluestem-----	40
					yellow Indiangrass-----	25
					eastern gamagrass-----	15
					prairie cordgrass-----	10
					switchgrass-----	10
					Canada wildrye-----	5
					Florida paspalum-----	5
					longstem spikeseedge-----	5
					marsh muhly-----	5
					tall dropseed-----	5
					Virginia wildrye-----	5
					yellow bristlegrass-----	5
7091:						
Wabash-----	Clay Lowland (pe30-37)	9,000	7,000	5,000	prairie cordgrass-----	50
					big bluestem-----	20
					switchgrass-----	20
					eastern gamagrass-----	10
					yellow Indiangrass-----	10

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum
		Favorable year	Normal year	Unfavorable year		rangeland compo- sition
		Lb/acre	Lb/acre	Lb/acre		Pct
7171: Reading-----	Loamy Lowland (pe30-37)	9,000	7,000	6,000	big bluestem-----	40
					yellow Indiangrass-----	25
					eastern gamagrass-----	15
					prairie cordgrass-----	10
					switchgrass-----	10
					Canada wildrye-----	5
					Florida paspalum-----	5
					longstem spikesedge-----	5
					marsh muhly-----	5
					tall dropseed-----	5
					Virginia wildrye-----	5
					yellow bristlegrass-----	5
7205: Aksarben-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem-----	40
					little bluestem-----	25
					yellow Indiangrass-----	15
					eastern gamagrass-----	10
					switchgrass-----	10
					porcupinegrass-----	5
7206: Aksarben-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem-----	30
					little bluestem-----	20
					switchgrass-----	10
					yellow Indiangrass-----	10
					leadplant-----	5
					misc. perennial grasses-----	5
					sideoats grama-----	5
					tall dropseed-----	5
7207: Aksarben-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem-----	30
					little bluestem-----	20
					switchgrass-----	10
					yellow Indiangrass-----	10
					leadplant-----	5
					misc. perennial grasses-----	5
					sideoats grama-----	5
					tall dropseed-----	5
7220: Burchard-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem-----	40
					little bluestem-----	25
					yellow Indiangrass-----	15
					eastern gamagrass-----	10
					switchgrass-----	10
					porcupinegrass-----	5
7225: Burchard-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem-----	40
					little bluestem-----	25
					yellow Indiangrass-----	15
					eastern gamagrass-----	10
					switchgrass-----	10
					porcupinegrass-----	5
Steinauer-----	Limy Upland (pe30-37)	4,500	3,900	3,400	big bluestem-----	35
					little bluestem-----	25
					sideoats grama-----	10
					switchgrass-----	10
					yellow Indiangrass-----	10

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland compo- sition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
7255: Grundy-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem----- yellow Indiangrass----- little bluestem----- switchgrass----- eastern gamagrass-----	40 20 15 15 10
7290: Marshall-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7293: Marshall-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7301: Martin-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7303: Martin-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7304: Martin-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7415: Mayberry-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem----- yellow Indiangrass----- little bluestem----- switchgrass----- eastern gamagrass-----	40 20 15 15 10

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland compo- sition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
7436:						
Morrill-----	Loamy Lowland (pe30-37)	6,000	5,000	4,000	big bluestem-----	40
					yellow Indiangrass-----	25
					eastern gamagrass-----	15
					prairie cordgrass-----	10
					switchgrass-----	10
					Canada wildrye-----	5
					Florida paspalum-----	5
					longstem spikesedge-----	5
					marsh muhly-----	5
					tall dropseed-----	5
					Virginia wildrye-----	5
					yellow bristlegrass-----	5
7455:						
Olmitz-----	Loamy Upland (pe30-37)	9,000	7,000	6,000	big bluestem-----	40
					little bluestem-----	25
					yellow Indiangrass-----	15
					eastern gamagrass-----	10
					switchgrass-----	10
					porcupinegrass-----	5
Padonia-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem-----	40
					yellow Indiangrass-----	20
					little bluestem-----	15
					switchgrass-----	15
					eastern gamagrass-----	10
Martin-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem-----	40
					little bluestem-----	25
					yellow Indiangrass-----	15
					eastern gamagrass-----	10
					switchgrass-----	10
					porcupinegrass-----	5
7471:						
Padonia-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem-----	40
					yellow Indiangrass-----	20
					little bluestem-----	15
					switchgrass-----	15
					eastern gamagrass-----	10
Martin-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem-----	40
					little bluestem-----	25
					yellow Indiangrass-----	15
					eastern gamagrass-----	10
					switchgrass-----	10
					porcupinegrass-----	5
7473:						
Padonia-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem-----	40
					yellow Indiangrass-----	20
					little bluestem-----	15
					switchgrass-----	15
					eastern gamagrass-----	10
Oska-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem-----	40
					yellow Indiangrass-----	20
					little bluestem-----	15
					switchgrass-----	15
					eastern gamagrass-----	10

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland compo- sition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
7500: Pawnee-----	Loamy Upland (pe30-37)	3,700	3,200	2,700	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7502: Pawnee-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem----- yellow Indiangrass----- little bluestem----- switchgrass----- eastern gamagrass-----	40 20 15 15 10
7504: Pawnee-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem----- yellow Indiangrass----- little bluestem----- switchgrass----- eastern gamagrass-----	40 20 15 15 10
7510: Pawnee-----	Loamy Upland (pe30-37)	2,500	2,000	1,500	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7515: Pawnee-----	Clay Upland (pe30-37)	6,500	4,500	3,500	big bluestem----- yellow Indiangrass----- little bluestem----- switchgrass----- eastern gamagrass-----	40 20 15 15 10
7585: Shelby-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7587: Shelby-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7681: Wymore-----	Clay Upland (pe30-37)	4,100	3,600	3,200	big bluestem----- yellow Indiangrass----- little bluestem----- switchgrass----- eastern gamagrass-----	40 20 15 15 10

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland compo- sition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
7683:						
Wymore-----	Loamy Lowland (pe30-37)	6,500	4,500	3,500	big bluestem-----	40
					yellow Indiangrass-----	25
					eastern gamagrass-----	15
					prairie cordgrass-----	10
					switchgrass-----	10
					Canada wildrye-----	5
					Florida paspalum-----	5
					longstem spikeseedge-----	5
					marsh muhly-----	5
					tall dropseed-----	5
					Virginia wildrye-----	5
					yellow bristlegrass-----	5
7688:						
Wymore-----	Clay Upland (pe30-37)	3,900	3,400	3,000	big bluestem-----	40
					yellow Indiangrass-----	20
					little bluestem-----	15
					switchgrass-----	15
					eastern gamagrass-----	10
Baileyville----	Clay Upland (pe30-37)	3,700	3,200	2,800	big bluestem-----	40
					yellow Indiangrass-----	20
					little bluestem-----	15
					switchgrass-----	15
					eastern gamagrass-----	10
7750:						
Nodaway-----	Loamy Lowland (pe30-37)	9,000	7,000	6,000	big bluestem-----	40
					yellow Indiangrass-----	25
					eastern gamagrass-----	15
					prairie cordgrass-----	10
					switchgrass-----	10
					Canada wildrye-----	5
					Florida paspalum-----	5
					longstem spikeseedge-----	5
					marsh muhly-----	5
					tall dropseed-----	5
					Virginia wildrye-----	5
					yellow bristlegrass-----	5
7851:						
Judson-----	Loamy Lowland (pe30-37)	9,000	7,000	6,000	big bluestem-----	40
					yellow Indiangrass-----	25
					eastern gamagrass-----	15
					prairie cordgrass-----	10
					switchgrass-----	10
					Canada wildrye-----	5
					Florida paspalum-----	5
					longstem spikeseedge-----	5
					marsh muhly-----	5
					tall dropseed-----	5
					Virginia wildrye-----	5
					yellow bristlegrass-----	5
7920:						
Contrary-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem-----	40
					little bluestem-----	25
					yellow Indiangrass-----	15
					eastern gamagrass-----	10
					switchgrass-----	10
					porcupinegrass-----	5

Table 8.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol and soil name	Ecological site	Total dry-weight production			Characteristic vegetation	Maximum rangeland compo- sition
		Favorable year	Normal year	Unfavorable year		
		Lb/acre	Lb/acre	Lb/acre		Pct
7965: Monona-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7966: Monona-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
7981: Pohocco-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
Netawaka-----	Limy Upland (pe30-37)	4,500	3,900	3,400	big bluestem----- little bluestem----- sideoats grama----- switchgrass----- yellow Indiangrass-----	35 25 10 10 10
7982: Pohocco-----	Loamy Upland (pe30-37)	6,000	5,000	4,000	big bluestem----- little bluestem----- yellow Indiangrass----- eastern gamagrass----- switchgrass----- porcupinegrass-----	40 25 15 10 10 5
Netawaka-----	Limy Upland (pe30-37)	4,500	3,900	3,400	big bluestem----- little bluestem----- sideoats grama----- switchgrass----- yellow Indiangrass-----	35 25 10 10 10

Table 9.--Forestland Management and Productivity

(Absence of an entry indicates that information was not available.)

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity		Trees to manage
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	
4350: Chase-----	3C	Slight	Slight	Moderate	Slight	Severe	black walnut----- bur oak----- common hackberry--- eastern cottonwood-- green ash-----	55 62 60 66 60	bur oak, common hackberry, eastern cottonwood, green ash
4725: Kipson. Sogn. 4832. Wamego 4834: Wamego. Vinland.									
7050: Kennebec-----	---	---	---	---	---	---	American sycamore--- bur oak----- black walnut----- common hackberry--- green ash----- eastern cottonwood--	90 63 79 69 69 87	bur oak, black walnut, common hackberry, green ash, eastern cottonwood, American sycamore
7051: Kennebec, frequently flooded-----	---	---	---	---	---	---	American sycamore--- bur oak----- black walnut----- common hackberry--- green ash----- eastern cottonwood--	90 63 79 69 69 87	bur oak, black walnut, common hackberry, green ash, eastern cottonwood, American sycamore
7060: Muscotah-----	3W	Slight	Moderate	Slight	Moderate	Severe	black walnut----- bur oak----- common hackberry--- eastern cottonwood-- green ash-----	62 62 65 80 65	black walnut, bur oak, common hackberry, eastern cottonwood, green ash
7061: Muscotah-----	3W	Slight	Moderate	Slight	Moderate	Severe	black walnut----- bur oak----- common hackberry--- eastern cottonwood-- green ash-----	68 62 65 80 65	black walnut, bur oak, common hackberry, eastern cottonwood, green ash
7091: Wabash-----	4W	Slight	Severe	Severe	Moderate	Severe	bur oak----- eastern cottonwood-- green ash-----	63 80 65	bur oak, eastern cottonwood, green ash

Table 9.--Forestland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity		Trees to manage
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	
7171: Reading-----	3A	Slight	Slight	Slight	Slight	Moderate	black walnut----- bur oak----- common hackberry---- northern red oak---- shagbark hickory----	73 60 69 75 62	black walnut, bur oak, common hackberry, eastern cottonwood, green ash, northern red oak
7205. Aksarben									
7206. Aksarben									
7207. Aksarben									
7220. Burchard									
7225: Burchard.									
Steinauer.									
7255. Grundy									
7290. Marshall									
7293. Marshall									
7301: Martin-----	3C	Slight	Slight	Moderate	Slight	Severe	---	---	---
7303: Martin-----	3C	Slight	Slight	Moderate	Slight	Severe	---	---	---
7304: Martin-----	3C	Slight	Slight	Moderate	Slight	Severe	---	---	---
7415. Mayberry									
7436. Morrill, eroded									
7455. Olmitz									
7470: Padonia.									
Martin-----	3C	Slight	Slight	Moderate	Slight	Severe	---	---	---
7471: Padonia.									
Martin-----	3C	Slight	Slight	Moderate	Slight	Severe	---	---	---

Table 9.--Forestland Management and Productivity--Continued

[illegible]

Table 9.--Forestland Management and Productivity--Continued

[illegible]

Table 10.--Windbreaks and Environmental Plantings

(Absence of an entry indicates that trees generally do not grow to the given height.)

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
4350:					
Chase-----	American hazelnut, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac.	American plum, amur privet, common lilac, Siberian peashrub, amur maple, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Siberian crabapple, white fir, white spruce.	Bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
4725:					
Kipson.					
Sogn.					
4832:					
Wamego-----	American hazelnut, golden currant, American plum, common lilac, Siberian peashrub, skunkbush sumac, 'Konza' fragrant sumac.	Amur maple, amur privet, common chokecherry, Siberian crabapple.	Common hackberry, green ash, osageorange, Russian mulberry, bitternut hickory, bur oak, chinkapin oak, eastern redcedar, honeylocust, red mulberry, black locust, black oak, northern catalpa, white oak.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
4834: Wamego-----	American hazelnut, golden currant, American plum, common lilac, Siberian peashrub, skunkbush sumac, 'Konza' fragrant sumac.	Amur maple, amur privet, common chokecherry, Siberian crabapple.	Common hackberry, green ash, osageorange, Russian mulberry, bitternut hickory, bur oak, chinkapin oak, eastern redcedar, honeylocust, red mulberry, black locust, black oak, northern catalpa, white oak.	---	---
Vinland.					
7050: Kennebec-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway spruce, pecan, pin oak, Shumard's oak, sugar maple, American basswood, honeylocust.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7051: Kennebec-----	American hazelnut, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac.	American plum, amur privet, common lilac, Siberian peashrub, amur maple, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Siberian crabapple, white fir, white spruce, northern red oak.	Bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
7060: Muscotah-----	American hazelnut, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac.	American plum, amur privet, common lilac, Siberian peashrub, amur maple, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Siberian crabapple, white fir, white spruce.	Bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7061: Muscotah-----	American hazelnut, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac.	American plum, amur privet, common lilac, Siberian peashrub, amur maple, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Siberian crabapple, white fir, white spruce.	Bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
7091: Wabash-----	False indigo, buttonbush, silky dogwood.	---	Common hackberry.	American basswood, bur oak, Kentucky coffeetree, Norway spruce, pin oak, red mulberry, Russian mulberry, white spruce, black willow, golden willow, green ash, peachleaf willow, pecan, shellbark hickory, American sycamore, honeylocust.	'Mighty Mo' eastern cottonwood, 'Ohio Red' eastern cottonwood, 'Platte' eastern cottonwood.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7171: Reading-----	American hazelnut, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac.	American plum, amur privet, common lilac, Siberian peashrub, amur maple, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Siberian crabapple, white fir, white spruce.	Bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
7205: Aksarben-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7206: Aksarben-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust.	---
7207: Aksarben-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, Norway spruce, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust.	---
7220: Burchard-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, Norway spruce, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7225: Burchard-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust.	---
Steinauer-----	Golden currant, American plum, common chokecherry, common lilac, Siberian peashrub, skunkbush sumac, 'Konza' fragrant sumac.	---	Bur oak, eastern redcedar, green ash, osageorange, Russian mulberry, black locust, blue spruce, honeylocust, black oak, chinkapin oak, northern catalpa, Shumard's oak.	---	---
7255: Grundy-----	American hazelnut, American plum, common lilac, 'Konza' fragrant sumac.	Amur maple, amur privet, common chokecherry, Siberian peashrub, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7290: Marshall-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway spruce, pecan, pin oak, Shumard's oak, sugar maple, American basswood, honeylocust.	---
7293: Marshall-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway spruce, pecan, pin oak, Shumard's oak, sugar maple, American basswood, honeylocust.	---
7301: Martin-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, black locust, chinkapin oak, honeylocust, Shumard's oak, white oak, black oak, northern catalpa.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7303: Martin-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, black locust, chinkapin oak, honeylocust, Shumard's oak, white oak, black oak, northern catalpa.	---	---
7304: Martin-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, black locust, chinkapin oak, honeylocust, Shumard's oak, white oak, black oak, northern catalpa.	---	---
7415: Mayberry-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, black locust, chinkapin oak, honeylocust, Shumard's oak, white oak, black oak, northern catalpa.	---	---
7436: Morrill-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7455: Olmitz-----	American hazelnut, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac.	American plum, amur privet, common lilac, Siberian peashrub, amur maple, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Siberian crabapple, white fir, white spruce.	Bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, northern red oak, Norway maple, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.
7470: Padonia-----	American hazelnut, golden currant, American plum, common lilac, Siberian peashrub, skunkbush sumac, 'Konza' fragrant sumac.	Amur maple, amur privet, common chokecherry, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, bitternut hickory, black locust, chinkapin oak, eastern redcedar, honeylocust, white oak, black oak, honeylocust, northern catalpa.	---	---
Martin-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, black locust, chinkapin oak, honeylocust, Shumard's oak, white oak, black oak, northern catalpa.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7471:					
Padonia-----	American hazelnut, golden currant, American plum, common lilac, Siberian peashrub, skunkbush sumac, 'Konza' fragrant sumac.	Amur maple, amur privet, common chokecherry, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, bitternut hickory, black locust, chinkapin oak, eastern redcedar, honeylocust, white oak, black oak, honeylocust, northern catalpa.	---	---
Martin-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, black locust, chinkapin oak, honeylocust, Shumard's oak, white oak, black oak, northern catalpa.	---	---
7473:					
Padonia-----	American hazelnut, golden currant, American plum, common lilac, Siberian peashrub, skunkbush sumac, 'Konza' fragrant sumac.	Amur maple, amur privet, common chokecherry, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, bitternut hickory, black locust, chinkapin oak, eastern redcedar, honeylocust, white oak, black oak, honeylocust, northern catalpa.	---	---
Oska-----	American hazelnut, golden currant, American plum, common lilac, Siberian peashrub, skunkbush sumac, 'Konza' fragrant sumac.	Amur maple, amur privet, common chokecherry, Siberian crabapple.	Common hackberry, green ash, osageorange, Russian mulberry, bitternut hickory, bur oak, chinkapin oak, eastern redcedar, honeylocust, red mulberry, black locust, black oak, northern catalpa, white oak.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7500: Pawnee-----	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm.	---
7502: Pawnee-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, Siberian crabapple.	Common hackberry, eastern redcedar, green ash, osageorange, pin oak, red mulberry, Russian mulberry, black locust, chinkapin oak, honeylocust, Shumard's oak, white oak, black oak, northern catalpa.	---	---
7504: Pawnee-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, Siberian crabapple.	Common hackberry, eastern redcedar, green ash, osageorange, pin oak, red mulberry, Russian mulberry, black locust, chinkapin oak, honeylocust, Shumard's oak, white oak, black oak, northern catalpa.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7510:					
Pawnee-----	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm. 	---
7515:					
Pawnee-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, Siberian crabapple.	Common hackberry, eastern redcedar, green ash, osageorange, pin oak, red mulberry, Russian mulberry, black locust, chinkapin oak, honeylocust, Shumard's oak, white oak, black oak, northern catalpa.	---	---
7585:					
Shelby-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7587: Shelby-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Bitternut hickory, black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway maple, Norway spruce, pecan, pin oak, sugar maple, American basswood, honeylocust.	---
7681: Wymore-----	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm.	---
7683: Wymore-----	American hazelnut, common lilac.	Common chokecherry, Siberian peashrub, Siberian crabapple.	Common hackberry, eastern redcedar, green ash, osageorange, pin oak, red mulberry, Russian mulberry, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7688: Wymore-----	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm.	---
Baileyville-----	American hazelnut, common lilac, Siberian peashrub, tamarisk, Tatarian honeysuckle.	'Cardinal' autumn-olive, eastern redcedar, Siberian crabapple.	Common hackberry, green ash, osageorange, pin oak, red mulberry, Russian mulberry, Russian olive, western soapberry, Austrian pine, bitternut hickory, black locust, chinkapin oak, honeylocust, white oak, black oak, northern catalpa.	Siberian elm.	---
7750: Nodaway-----	American hazelnut, golden currant, blackhaw, forsythia, gray dogwood, Nanking cherry, redosier dogwood, 'Konza' fragrant sumac.	American plum, amur privet, common lilac, Siberian peashrub, amur maple, common chokecherry.	Eastern redbud, oriental arborvitae, Washington hawthorn, blue spruce, eastern redcedar, osageorange, red mulberry, Russian mulberry, Siberian crabapple, white fir, white spruce, northern red oak.	Bitternut hickory, black walnut, bur oak, chinkapin oak, common hackberry, lacebark elm, northern catalpa, pin oak, shagbark hickory, shellbark hickory, sugar maple, white oak, American basswood, black cherry, black locust, black oak, black willow, golden willow, green ash, Kentucky coffeetree, Norway spruce, peachleaf willow, pecan, American sycamore, eastern white pine, honeylocust.	'Ohio Red' eastern cottonwood, 'Mighty Mo' eastern cottonwood, 'Platte' eastern cottonwood.

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7851: Judson-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway spruce, pecan, pin oak, Shumard's oak, sugar maple, American basswood, honeylocust.	---
7920: Contrary-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, norway spruce, pecan, pin oak, Shumard's oak, sugar maple, American basswood, honeylocust.	---
7965: Monona-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway spruce, pecan, pin oak, Shumard's oak, sugar maple, American basswood, honeylocust.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7966: Monona-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway spruce, pecan, pin oak, Shumard's oak, sugar maple, American basswood, honeylocust.	---
7981: Pohocco-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway spruce, pecan, pin oak, Shumard's oak, sugar maple, American basswood, honeylocust.	---
Netawaka-----	Golden currant, American plum, common chokecherry, common lilac, Siberian peashrub, skunkbush sumac, 'Konza' fragrant sumac.	---	Bur oak, eastern redcedar, Russian mulberry, blue spruce, green ash, honeylocust, osageorange, black oak, chinkapin oak, northern catalpa, Shumard's oak.	---	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
7982: Pohocco-----	American hazelnut, golden currant, Nanking cherry, American plum, blackhaw, common lilac, forsythia, gray dogwood, redosier dogwood, 'Konza' fragrant sumac.	Amur privet, common chokecherry, Siberian peashrub, amur maple.	Eastern redbud, oriental arborvitae, Siberian crabapple, Washington hawthorn, eastern redcedar, osageorange, blue spruce, bur oak, chinkapin oak, common hackberry, eastern white pine, red mulberry, Russian mulberry, white fir, white oak, white spruce.	Black locust, black oak, green ash, Kentucky coffeetree, lacebark elm, northern catalpa, northern red oak, Norway spruce, pecan, pin oak, Shumard's oak, sugar maple, American basswood, honeylocust.	---
Netawaka-----	Golden currant, American plum, common chokecherry, common lilac, Siberian peashrub, skunkbush sumac, 'Konza' fragrant sumac.	---	Bur oak, eastern redcedar, Russian mulberry, blue spruce, green ash, honeylocust, osageorange, black oak, chinkapin oak, northern catalpa, Shumard's oak.	---	---

Table 11.--Recreation

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
4350: Chase-----	90	Very limited: Flooding Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Not limited	Not limited	Somewhat limited: Depth to saturated zone
4725: Kipson-----	60	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope	Somewhat limited Slope	Not limited	Very limited: Depth to bedrock Slope Carbonate content Droughty
Sogn-----	30	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope Content of large stones	Not limited	Not limited	Very limited: Depth to bedrock Slope Droughty Content of large stones
4832: Wamego-----	90	Very limited: Restricted permeability	Very limited: Restricted permeability	Very limited: Restricted permeability Slope Depth to bedrock	Not limited	Not limited	Somewhat limited: Depth to bedrock
4834: Wamego-----	50	Somewhat limited Restricted permeability Slope	Somewhat limited Restricted permeability Slope	Very limited: Slope Restricted permeability Depth to bedrock	Not limited	Not limited	Somewhat limited: Depth to bedrock Slope
Vinland-----	40	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope Gravel content	Not limited	Not limited	Very limited: Depth to bedrock Slope Droughty
7050: Kennebec-----	89	Very limited: Flooding	Not limited	Somewhat limited Flooding	Not limited	Not limited	Somewhat limited: Flooding
7051: Kennebec, frequently flooded-----	85	Very limited: Flooding	Somewhat limited Flooding	Very limited: Flooding	Somewhat limited Flooding	Somewhat limited Flooding	Very limited: Flooding

Table 11.--Recreation--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
7060: Muscotah-----	87	Very limited: Flooding Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Flooding Depth to saturated zone	Not limited	Not limited	Somewhat limited: Flooding Depth to saturated zone
7061: Muscotah-----	87	Very limited: Flooding Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Flooding Depth to saturated zone	Not limited	Not limited	Somewhat limited: Flooding Depth to saturated zone
7091: Wabash-----	85	Very limited: Depth to saturated zone Flooding Restricted permeability Too clayey	Very limited: Depth to saturated zone Restricted permeability Too clayey	Very limited: Depth to saturated zone Restricted permeability Too clayey Flooding	Very limited: Depth to saturated zone Too clayey	Very limited: Depth to saturated zone Too clayey	Very limited: Depth to saturated zone Too clayey Flooding
7171: Reading-----	90	Very limited: Flooding	Not limited	Not limited	Not limited	Not limited	Not limited
7205: Aksarben-----	90	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Not limited	Not limited	Not limited
7206: Aksarben-----	87	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Somewhat limited Slope Restricted permeability	Not limited	Not limited	Not limited
7207: Aksarben-----	85	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Very limited: Slope Restricted permeability	Not limited	Not limited	Not limited
7220: Burchard-----	85	Somewhat limited Restricted permeability Slope	Somewhat limited Restricted permeability Slope	Very limited: Slope Restricted permeability	Not limited	Not limited	Somewhat limited: Slope
7225: Burchard-----	55	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability	Not limited	Not limited	Very limited: Slope

Table 11.--Recreation--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
7225: Steinauer----	40	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability	Not limited	Not limited	Very limited: Slope
7255: Grundy-----	90	Very limited: Depth to saturated zone Restricted permeability	Somewhat limited Depth to saturated zone Restricted permeability	Very limited: Depth to saturated zone Restricted permeability	Somewhat limited Depth to saturated zone	Somewhat limited Depth to saturated zone	Somewhat limited: Depth to saturated zone
7290: Marshall----	97	Not limited	Not limited	Somewhat limited Slope	Not limited	Not limited	Not limited
7293: Marshall----	82	Not limited	Not limited	Very limited: Slope	Not limited	Not limited	Not limited
7301: Martin-----	85	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone Slope	Not limited	Not limited	Somewhat limited: Depth to saturated zone
7303: Martin-----	90	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Very limited: Slope Restricted permeability Depth to saturated zone	Not limited	Not limited	Somewhat limited: Depth to saturated zone
7304: Martin-----	90	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Slope Depth to saturated zone	Very limited: Water erosion	Very limited: Water erosion	Somewhat limited: Depth to saturated zone Slope
7415: Mayberry----	85	Very limited: Depth to saturated zone Restricted permeability	Very limited: Depth to saturated zone Restricted permeability	Very limited: Depth to saturated zone Restricted permeability Slope	Very limited: Depth to saturated zone	Very limited: Depth to saturated zone	Very limited: Depth to saturated zone

Table 11.--Recreation--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
7436: Morrill, eroded-----	87	Somewhat limited Restricted permeability Slope	Somewhat limited Restricted permeability Slope	Very limited: Slope Restricted permeability Gravel content	Not limited	Not limited	Somewhat limited: Slope
7455: Olmitz-----	93	Not limited	Not limited	Somewhat limited Slope	Not limited	Not limited	Not limited
7470: Padonia-----	50	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Very limited: Slope Restricted permeability Depth to bedrock	Not limited	Not limited	Somewhat limited: Depth to bedrock
Martin-----	40	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Very limited: Slope Restricted permeability Depth to saturated zone	Not limited	Not limited	Somewhat limited: Depth to saturated zone
7471: Padonia-----	60	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability Depth to bedrock	Very limited: Water erosion Slope	Very limited: Water erosion	Very limited: Slope Depth to bedrock
Martin-----	30	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Slope Depth to saturated zone	Very limited: Slope Restricted permeability Depth to saturated zone	Very limited: Water erosion	Very limited: Water erosion	Somewhat limited: Slope Depth to saturated zone
7473: Padonia-----	55	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Very limited: Slope Restricted permeability Depth to bedrock	Not limited	Not limited	Somewhat limited: Depth to bedrock
Oska-----	40	Somewhat limited Restricted permeability	Somewhat limited Restricted permeability	Very limited: Slope Restricted permeability Depth to bedrock	Not limited	Not limited	Somewhat limited: Depth to bedrock

Table 11.--Recreation--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
7500: Pawnee-----	90	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone Slope	Not limited	Not limited	Somewhat limited: Depth to saturated zone
7502: Pawnee-----	85	Very limited: Depth to saturated zone Restricted permeability	Somewhat limited Depth to saturated zone Restricted permeability	Very limited: Depth to saturated zone Restricted permeability Slope	Somewhat limited Depth to saturated zone	Somewhat limited Depth to saturated zone	Somewhat limited: Depth to saturated zone
7504: Pawnee-----	85	Very limited: Depth to saturated zone Restricted permeability Slope	Somewhat limited Depth to saturated zone Restricted permeability Slope	Very limited: Depth to saturated zone Slope Restricted permeability	Very limited: Water erosion Depth to saturated zone	Very limited: Water erosion Depth to saturated zone	Somewhat limited: Depth to saturated zone Slope
7510: Pawnee, eroded-----	85	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Very limited: Slope Restricted permeability Depth to saturated zone	Not limited	Not limited	Somewhat limited: Depth to saturated zone
7515: Pawnee, eroded-----	84	Very limited: Depth to saturated zone Too clayey Restricted permeability Slope	Very limited: Too clayey Depth to saturated zone Restricted permeability Slope	Very limited: Depth to saturated zone Slope Too clayey Restricted permeability	Very limited: Too clayey Water erosion Depth to saturated zone	Very limited: Too clayey Water erosion Depth to saturated zone	Very limited: Too clayey Slope Droughty Depth to saturated zone
7585: Shelby-----	88	Somewhat limited Restricted permeability Slope	Somewhat limited Restricted permeability Slope	Very limited: Slope Restricted permeability	Not limited	Not limited	Somewhat limited: Slope
7587: Shelby, eroded-----	85	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability	Not limited	Not limited	Very limited: Slope

Table 11.--Recreation--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
7681: Wymore-----	90	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Not limited	Not limited	Somewhat limited: Depth to saturated zone
7683: Wymore-----	90	Very limited: Depth to saturated zone Restricted permeability	Somewhat limited Depth to saturated zone Restricted permeability	Very limited: Depth to saturated zone Restricted permeability Slope	Somewhat limited Depth to saturated zone	Somewhat limited Depth to saturated zone	Somewhat limited: Depth to saturated zone
7688: Wymore-----	45	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Slope Depth to saturated zone	Not limited	Not limited	Somewhat limited: Depth to saturated zone
Baileyville--	40	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Depth to saturated zone	Somewhat limited Restricted permeability Slope Depth to saturated zone	Not limited	Not limited	Somewhat limited: Depth to saturated zone
7750: Nodaway-----	90	Very limited: Flooding	Not limited	Somewhat limited Flooding	Not limited	Not limited	Somewhat limited: Flooding
7851: Judson-----	95	Not limited	Not limited	Somewhat limited Slope	Not limited	Not limited	Not limited
7920: Contrary-----	85	Not limited	Not limited	Very limited: Slope	Not limited	Not limited	Not limited
7965: Monona-----	90	Not limited	Not limited	Somewhat limited Slope	Not limited	Not limited	Not limited
7966: Monona, eroded-----	82	Not limited	Not limited	Very limited: Slope	Not limited	Not limited	Not limited
7981: Pohocco, eroded-----	50	Somewhat limited Slope	Somewhat limited Slope	Very limited: Slope	Very limited: Water erosion	Very limited: Water erosion	Somewhat limited: Slope
Netawaka----	40	Somewhat limited Slope	Somewhat limited Slope	Very limited: Slope	Very limited: Water erosion	Very limited: Water erosion	Somewhat limited: Slope

Table 11.--Recreation--Continued

Map symbol and soil name	Pct. of map unit	Camp areas	Picnic areas	Playgrounds	Paths and trails	Off-road motorcycle trails	Golf fairways
7982:							
Pohocco-----	50	Very limited: Slope	Very limited: Slope	Very limited: Slope	Very limited: Water erosion Slope	Very limited: Water erosion	Very limited: Slope
Netawaka-----	40	Very limited: Slope	Very limited: Slope	Very limited: Slope	Very limited: Water erosion Slope	Very limited: Water erosion	Very limited: Slope
9971:							
Arents, earthen dam-	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9983:							
Gravel pits and quarries	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9986:							
Miscellaneous water-----	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9999:							
Water-----	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Table 12.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
4350: Chase-----	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good
4725: Kipson-----	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair
Sogn-----	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor
4832: Wamego-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
4834: Wamego-----	Poor	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
Vinland-----	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair
7050: Kennebec-----	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good
7051: Kennebec, frequently flooded-----	Poor	Poor	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good
7060: Muscotah-----	Fair	Good	Good	Fair	Fair	Good	Fair	Fair	Good	Fair	Fair	Fair
7061: Muscotah-----	Fair	Good	Good	Fair	Fair	Good	Fair	Fair	Good	Fair	Fair	Fair
7091: Wabash-----	Poor	Fair	Fair	Poor	Poor	Fair	Good	Good	Fair	Poor	Fair	Poor
7171: Reading-----	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good
7205: Aksarben-----	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7206: Aksarben-----	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7207: Aksarben-----	Fair	Good	Good	Good	Good	Good	Very poor.	Poor	Good	Good	Very poor.	Good
7220: Burchard-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good

Table 12.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
7225:												
Burchard-----	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good
Steinauer-----	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good
7255:												
Grundy-----	Fair	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good
7290:												
Marshall-----	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7293:												
Marshall-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7301:												
Martin-----	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good
7303:												
Martin-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7304:												
Martin-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7415:												
Mayberry-----	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good
7436:												
Morrill, eroded-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7455:												
Olmitz-----	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good
7470:												
Padonia-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
Martin-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7471:												
Padonia-----	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Fair
Martin-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7473:												
Padonia-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
Oska-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good

Table 12.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Shrubs	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life	Range- land wild- life
7500: Pawnee-----	Fair	Good	Good	---	Fair	Fair	Very poor.	Poor	Good	---	Poor	Fair
7502: Pawnee-----	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good
7504: Pawnee-----	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good
7510: Pawnee, eroded-----	Fair	Good	Good	---	Fair	Fair	Very poor.	Poor	Good	---	Poor	Fair
7515: Pawnee, eroded-----	Poor	Fair	Fair	Poor	Poor	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair
7585: Shelby-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7587: Shelby, eroded-----	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7681: Wymore-----	Fair	Good	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair
7683: Wymore-----	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good
7688: Wymore-----	Fair	Good	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair
Baileyville-----	Fair	Good	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair
7750: Nodaway-----	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good
7851: Judson-----	Good	Good	Good	Good	Good	---	Poor	Poor	Good	Good	Poor	---
7920: Contrary-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7965: Monona-----	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7966: Monona, eroded-----	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good
7981: Pohocco, eroded-----	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good

Table 12.--Wildlife Habitat--Continued

[illegible]

Table 13.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
4350: Chase-----	90	Very limited: Flooding Shrink-swell Depth to saturated zone	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Flooding Shrink-swell Depth to saturated zone	Very limited: Shrink-swell Frost action Low strength Flooding Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone
4725: Kipson-----	60	Very limited: Depth to soft bedrock Slope Shrink-swell	Very limited: Depth to soft bedrock Slope Shrink-swell	Very limited: Depth to soft bedrock Slope Shrink-swell	Very limited: Depth to soft bedrock Slope Low strength Shrink-swell Frost action	Very limited: Depth to soft bedrock Slope Cutbanks cave	Very limited: Depth to bedrock Slope Carbonate content Content of large stones Droughty
Sogn-----	30	Very limited: Depth to hard bedrock Slope Shrink-swell	Very limited: Depth to hard bedrock Slope Shrink-swell	Very limited: Depth to hard bedrock Slope Shrink-swell	Very limited: Depth to hard bedrock Low strength Slope Shrink-swell Frost action	Very limited: Depth to hard bedrock Slope Cutbanks cave	Very limited: Depth to bedrock Slope Droughty Content of large stones
4832: Wamego-----	90	Not limited	Somewhat limited: Depth to soft bedrock	Somewhat limited: Slope	Somewhat limited: Frost action	Somewhat limited: Depth to soft bedrock Cutbanks cave	Somewhat limited: Depth to bedrock
4834: Wamego-----	50	Somewhat limited: Slope	Somewhat limited: Depth to soft bedrock Slope	Very limited: Slope	Somewhat limited: Frost action Slope	Somewhat limited: Depth to soft bedrock Cutbanks cave Slope	Somewhat limited: Depth to bedrock Slope
Vinland-----	40	Somewhat limited: Depth to soft bedrock Shrink-swell Slope	Very limited: Depth to soft bedrock Shrink-swell Slope	Very limited: Depth to soft bedrock Slope Shrink-swell	Very limited: Depth to soft bedrock Low strength Frost action Shrink-swell Slope	Very limited: Depth to soft bedrock Cutbanks cave Slope	Very limited: Depth to bedrock Slope Droughty
7050: Kennebec-----	89	Very limited: Flooding Shrink-swell	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Frost action Flooding Low strength Shrink-swell	Somewhat limited: Depth to saturated zone Flooding Cutbanks cave	Somewhat limited: Flooding

Table 13.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
7051: Kennebec, frequently flooded-----	85	Very limited: Flooding Shrink-swell	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Frost action Flooding Low strength Shrink-swell	Somewhat limited Depth to saturated zone Flooding Cutbanks cave	Very limited: Flooding
7060: Muscotah-----	87	Very limited: Flooding Shrink-swell Depth to saturated zone	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Flooding Shrink-swell Depth to saturated zone	Very limited: Flooding Low strength Shrink-swell Frost action Depth to saturated zone	Very limited: Depth to saturated zone Flooding Cutbanks cave Too clayey	Somewhat limited: Flooding Depth to saturated zone
7061: Muscotah-----	87	Very limited: Flooding Shrink-swell Depth to saturated zone	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Flooding Shrink-swell Depth to saturated zone	Very limited: Flooding Low strength Shrink-swell Frost action Depth to saturated zone	Very limited: Depth to saturated zone Flooding Cutbanks cave Too clayey	Somewhat limited: Flooding Depth to saturated zone
7091: Wabash-----	85	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Depth to saturated zone Frost action Flooding Low strength	Very limited: Depth to saturated zone Flooding Too clayey Cutbanks cave	Very limited: Depth to saturated zone Too clayey Flooding
7171: Reading-----	90	Very limited: Flooding Shrink-swell	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Frost action Low strength Shrink-swell Flooding	Somewhat limited Depth to saturated zone Cutbanks cave	Not limited
7205: Aksarben-----	90	Very limited: Shrink-swell	Somewhat limited Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell Frost action Low strength	Somewhat limited Cutbanks cave	Not limited
7206: Aksarben-----	87	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell Frost action Low strength	Somewhat limited Cutbanks cave	Not limited

Table 13.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
7207: Aksarben-----	85	Very limited: Shrink-swell	Very limited: Shrink-swell	Very limited: Shrink-swell Slope	Very limited: Shrink-swell Frost action Low strength	Somewhat limited Cutbanks cave	Not limited
7220: Burchard-----	85	Somewhat limited Shrink-swell Slope	Somewhat limited Shrink-swell Slope	Very limited: Slope Shrink-swell	Very limited: Low strength Shrink-swell Frost action Slope	Somewhat limited Cutbanks cave Slope	Somewhat limited: Slope
7225: Burchard-----	55	Very limited: Slope Shrink-swell	Very limited: Slope Shrink-swell	Very limited: Slope Shrink-swell	Very limited: Low strength Slope Shrink-swell Frost action	Very limited: Slope Cutbanks cave	Very limited: Slope
Steinauer----	40	Very limited: Slope Shrink-swell	Very limited: Slope Shrink-swell	Very limited: Slope Shrink-swell	Very limited: Slope Low strength Frost action Shrink-swell	Very limited: Slope Cutbanks cave	Very limited: Slope
7255: Grundy-----	90	Very limited: Depth to saturated zone Shrink-swell	Very limited: Depth to saturated zone Shrink-swell	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone
7290: Marshall-----	97	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Very limited: Frost action Low strength Shrink-swell	Somewhat limited Cutbanks cave	Not limited
7293: Marshall-----	82	Somewhat limited Shrink-swell	Somewhat limited Shrink-swell	Very limited: Slope Shrink-swell	Very limited: Frost action Low strength Shrink-swell	Somewhat limited Cutbanks cave	Not limited
7301: Martin-----	85	Very limited: Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Depth to saturated zone	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone

Table 13.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
7303: Martin-----	90	Very limited: Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Depth to saturated zone Slope	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone
7304: Martin-----	90	Very limited: Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Shrink-swell Slope	Very limited: Slope Depth to saturated zone	Very limited: Frost action Low strength Shrink-swell Depth to saturated zone Slope	Very limited: Depth to saturated zone Too clayey Cutbanks cave Slope	Somewhat limited: Depth to saturated zone
7415: Mayberry-----	85	Very limited: Depth to saturated zone Shrink-swell	Very limited: Depth to saturated zone Shrink-swell	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Depth to saturated zone Frost action Low strength	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Very limited: Depth to saturated zone
7436: Morrill, eroded-----	87	Somewhat limited Shrink-swell Slope	Somewhat limited Shrink-swell Slope	Very limited: Slope Shrink-swell	Somewhat limited Low strength Shrink-swell Frost action Slope	Very limited: Cutbanks cave Slope	Somewhat limited: Slope
7455: Olmitz-----	93	Somewhat limited Shrink-swell	Somewhat limited Depth to saturated zone Shrink-swell	Somewhat limited Shrink-swell	Very limited: Low strength Shrink-swell Frost action	Somewhat limited Depth to saturated zone Cutbanks cave	Not limited
7470: Padonia-----	50	Very limited: Shrink-swell	Very limited: Shrink-swell Depth to soft bedrock	Very limited: Shrink-swell Slope	Very limited: Low strength Shrink-swell Frost action	Somewhat limited Cutbanks cave Too clayey Depth to soft bedrock	Somewhat limited: Depth to bedrock
Martin-----	40	Very limited: Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Slope Depth to saturated zone	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone

Table 13.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
7471: Padonia-----	60	Very limited: Shrink-swell Slope	Very limited: Shrink-swell Slope Depth to soft bedrock	Very limited: Slope Shrink-swell	Very limited: Low strength Shrink-swell Slope Frost action	Very limited: Slope Cutbanks cave Too clayey Depth to soft bedrock	Very limited: Slope Depth to bedrock
Martin-----	30	Very limited: Shrink-swell Depth to saturated zone Slope	Very limited: Depth to saturated zone Shrink-swell Slope	Very limited: Shrink-swell Slope Depth to saturated zone	Very limited: Shrink-swell Frost action Low strength Slope Depth to saturated zone	Very limited: Depth to saturated zone Slope Too clayey Cutbanks cave	Somewhat limited: Slope Depth to saturated zone
7473: Padonia-----	55	Very limited: Shrink-swell	Very limited: Shrink-swell Depth to soft bedrock	Very limited: Shrink-swell Slope	Very limited: Low strength Shrink-swell Frost action	Somewhat limited: Cutbanks cave Too clayey Depth to soft bedrock	Somewhat limited: Depth to bedrock
Oska-----	40	Very limited: Shrink-swell Depth to hard bedrock	Very limited: Shrink-swell Depth to hard bedrock	Very limited: Shrink-swell Slope Depth to hard bedrock	Very limited: Shrink-swell Low strength Frost action Depth to hard bedrock	Very limited: Depth to hard bedrock Cutbanks cave Too clayey	Somewhat limited: Depth to bedrock
7500: Pawnee-----	90	Very limited: Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Depth to saturated zone	Very limited: Frost action Low strength Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone
7502: Pawnee-----	85	Very limited: Depth to saturated zone Shrink-swell	Very limited: Depth to saturated zone Shrink-swell	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone
7504: Pawnee-----	85	Very limited: Depth to saturated zone Shrink-swell Slope	Very limited: Depth to saturated zone Shrink-swell Slope	Very limited: Depth to saturated zone Shrink-swell Slope	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone Slope	Very limited: Depth to saturated zone Too clayey Cutbanks cave Slope	Somewhat limited: Depth to saturated zone Slope

Table 13.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
7510: Pawnee, eroded-----	85	Very limited: Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Slope Depth to saturated zone	Very limited: Frost action Low strength Shrink-swell Depth to saturated	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone
7515: Pawnee, eroded-----	84	Very limited: Depth to saturated zone Shrink-swell Slope	Very limited: Depth to saturated zone Shrink-swell Slope	Very limited: Depth to saturated zone Shrink-swell Slope	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone Slope	Very limited: Depth to saturated zone Too clayey Cutbanks cave Slope	Very limited: Too clayey Depth to saturated zone Slope Droughty
7585: Shelby-----	88	Somewhat limited: Shrink-swell Slope	Somewhat limited: Shrink-swell Slope	Very limited: Slope Shrink-swell	Very limited: Low strength Shrink-swell Frost action Slope	Somewhat limited: Cutbanks cave Slope	Somewhat limited: Slope
7587: Shelby, eroded-----	85	Very limited: Slope Shrink-swell	Very limited: Slope Shrink-swell	Very limited: Slope Shrink-swell	Very limited: Low strength Slope Shrink-swell Frost action	Very limited: Slope Cutbanks cave	Very limited: Slope
7681: Wymore-----	90	Very limited: Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Depth to saturated zone	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone
7683: Wymore-----	90	Very limited: Depth to saturated zone Shrink-swell	Very limited: Depth to saturated zone Shrink-swell	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone
7688: Wymore-----	45	Very limited: Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Depth to saturated zone	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone

Table 13.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
7688: Baileyville--	40	Very limited: Shrink-swell Depth to saturated zone	Very limited: Depth to saturated zone Shrink-swell	Very limited: Shrink-swell Depth to saturated zone	Very limited: Shrink-swell Frost action Low strength Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Cutbanks cave	Somewhat limited: Depth to saturated zone
7750: Nodaway-----	90	Very limited: Flooding Shrink-swell	Very limited: Flooding Depth to saturated zone Shrink-swell	Very limited: Flooding Shrink-swell	Very limited: Frost action Flooding Low strength Shrink-swell	Somewhat limited: Depth to saturated zone Flooding Cutbanks cave	Somewhat limited: Flooding
7851: Judson-----	95	Somewhat limited: Shrink-swell	Somewhat limited: Shrink-swell	Somewhat limited: Shrink-swell	Very limited: Frost action Low strength Shrink-swell	Somewhat limited: Cutbanks cave	Not limited
7920: Contrary-----	85	Somewhat limited: Shrink-swell	Somewhat limited: Shrink-swell	Somewhat limited: Slope Shrink-swell	Very limited: Frost action Low strength Shrink-swell	Somewhat limited: Cutbanks cave	Not limited
7965: Monona-----	90	Somewhat limited: Shrink-swell	Not limited	Somewhat limited: Shrink-swell	Very limited: Frost action Low strength Shrink-swell	Somewhat limited: Cutbanks cave	Not limited
7966: Monona, eroded-----	82	Somewhat limited: Shrink-swell	Not limited	Very limited: Slope Shrink-swell	Very limited: Frost action Low strength Shrink-swell	Somewhat limited: Cutbanks cave	Not limited
7981: Pohocco, eroded-----	50	Somewhat limited: Slope Shrink-swell	Somewhat limited: Slope	Very limited: Slope Shrink-swell	Very limited: Frost action Low strength Slope Shrink-swell	Somewhat limited: Slope Cutbanks cave	Somewhat limited: Slope
Netawaka-----	40	Somewhat limited: Slope	Somewhat limited: Slope	Very limited: Slope	Very limited: Frost action Low strength Slope	Somewhat limited: Slope Cutbanks cave	Somewhat limited: Slope
7982: Pohocco-----	50	Very limited: Slope Shrink-swell	Very limited: Slope	Very limited: Slope Shrink-swell	Very limited: Slope Frost action Low strength Shrink-swell	Very limited: Slope Cutbanks cave	Very limited: Slope

Table 13.--Building Site Development--Continued

Map symbol and soil name	Pct. of map unit	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Shallow excavations	Lawns and landscaping
7982: Netawaka-----	40	Very limited: Slope	Very limited: Slope	Very limited: Slope	Very limited: Slope Frost action Low strength	Very limited: Slope Cutbanks cave	Very limited: Slope
9971: Arents, earthen dam-	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9983: Gravel pits and quarries	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9986: Miscellaneous water-----	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9999: Water-----	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Table 14.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
4350: Chase-----	90	Very limited: Restricted permeability Depth to saturated zone Flooding	Somewhat limited Depth to saturated zone Flooding	Very limited: Depth to saturated zone Too clayey Flooding	Somewhat limited Depth to saturated zone Flooding	Very limited: Too clayey Hard to compact Depth to saturated zone
4725: Kipson-----	60	Very limited: Depth to bedrock Slope	Very limited: Depth to soft bedrock Slope Seepage	Very limited: Depth to bedrock Slope Too clayey	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope Carbonate content Too clayey
Sogn-----	30	Very limited: Depth to bedrock Slope	Very limited: Depth to hard bedrock Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope Too clayey
4832: Wamego-----	90	Very limited: Restricted permeability Depth to bedrock	Very limited: Depth to soft bedrock Slope	Very limited: Depth to bedrock	Very limited: Depth to bedrock	Very limited: Depth to bedrock Hard to compact
4834: Wamego-----	50	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to soft bedrock Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Hard to compact Slope
Vinland-----	40	Very limited: Depth to bedrock Slope	Very limited: Depth to soft bedrock Slope Seepage	Very limited: Depth to bedrock Too clayey Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Too clayey Slope
7050: Kennebec-----	89	Very limited: Flooding Depth to saturated zone Restricted permeability	Very limited: Flooding Depth to saturated zone Seepage	Very limited: Flooding Depth to saturated zone	Very limited: Flooding Depth to saturated zone	Not limited

Table 14.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7051: Kennebec, frequently flooded-----	85	Very limited: Flooding Depth to saturated zone Restricted permeability	Very limited: Flooding Depth to saturated zone Seepage	Very limited: Flooding Depth to saturated zone	Very limited: Flooding Depth to saturated zone	Not limited
7060: Muscotah-----	87	Very limited: Flooding Restricted permeability Depth to saturated zone	Very limited: Flooding Depth to saturated zone Seepage	Very limited: Flooding Depth to saturated zone Too clayey	Very limited: Flooding Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
7061: Muscotah-----	87	Very limited: Flooding Restricted permeability Depth to saturated zone	Very limited: Flooding Depth to saturated zone	Very limited: Flooding Depth to saturated zone Too clayey	Very limited: Flooding Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
7091: Wabash-----	85	Very limited: Flooding Restricted permeability Depth to saturated zone	Very limited: Flooding Depth to saturated zone	Very limited: Flooding Depth to saturated zone Too clayey	Very limited: Flooding Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Hard to compact
7171: Reading-----	90	Somewhat limited Restricted permeability Flooding	Somewhat limited Seepage Flooding	Somewhat limited Too clayey Flooding	Somewhat limited Flooding	Somewhat limited: Too clayey
7205: Aksarben-----	90	Very limited: Restricted permeability	Somewhat limited Seepage	Not limited	Not limited	Somewhat limited: Too clayey
7206: Aksarben-----	87	Very limited: Restricted permeability	Somewhat limited Seepage Slope	Somewhat limited Too clayey	Not limited	Very limited: Hard to compact Too clayey
7207: Aksarben-----	85	Very limited: Restricted permeability	Very limited: Slope Seepage	Somewhat limited Too clayey	Not limited	Very limited: Hard to compact Too clayey

Table 14.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7220: Burchard-----	85	Very limited: Restricted permeability Slope	Very limited: Slope	Somewhat limited Slope	Somewhat limited Slope	Somewhat limited: Slope
7225: Burchard-----	55	Very limited: Restricted permeability Slope	Very limited: Slope	Very limited: Slope	Very limited: Slope	Very limited: Slope
Steinauer----	40	Very limited: Restricted permeability Slope	Very limited: Slope	Very limited: Slope Too clayey	Very limited: Slope	Very limited: Slope Too clayey
7255: Grundy-----	90	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone	Very limited: Depth to saturated zone Too clayey	Very limited: Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Hard to compact
7290: Marshall-----	97	Somewhat limited Restricted permeability	Somewhat limited Seepage Slope	Not limited	Not limited	Not limited
7293: Marshall-----	82	Somewhat limited Restricted permeability	Very limited: Slope Seepage	Not limited	Not limited	Not limited
7301: Martin-----	85	Very limited: Restricted permeability Depth to saturated zone	Somewhat limited Depth to saturated zone Slope	Very limited: Too clayey Depth to saturated zone	Somewhat limited Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
7303: Martin-----	90	Very limited: Restricted permeability Depth to saturated zone	Somewhat limited Depth to saturated zone Slope	Very limited: Too clayey Depth to saturated zone	Somewhat limited Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
7304: Martin-----	90	Very limited: Restricted permeability Depth to saturated zone Slope	Very limited: Slope Depth to saturated zone	Very limited: Too clayey Depth to saturated zone Slope	Somewhat limited Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone Slope

Table 14.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7415: Mayberry-----	85	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Slope	Very limited: Depth to saturated zone Too clayey	Very limited: Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Hard to compact
7436: Morrill, eroded-----	87	Very limited: Restricted permeability Seepage Slope	Very limited: Slope Seepage	Very limited: Seepage Slope	Somewhat limited: Slope	Somewhat limited: Seepage Slope
7455: Olmitz-----	93	Very limited: Depth to saturated zone Restricted permeability	Somewhat limited: Depth to saturated zone Seepage Slope	Very limited: Depth to saturated zone Too clayey	Very limited: Depth to saturated zone	Somewhat limited: Too clayey
7470: Padonia-----	50	Very limited: Restricted permeability Depth to bedrock	Very limited: Depth to soft bedrock Slope	Very limited: Depth to bedrock Too clayey	Very limited: Depth to bedrock	Very limited: Depth to bedrock Too clayey Hard to compact
Martin-----	40	Very limited: Restricted permeability Depth to saturated zone	Very limited: Slope Depth to saturated zone	Very limited: Too clayey Depth to saturated zone	Somewhat limited: Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
7471: Padonia-----	60	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to soft bedrock Slope	Very limited: Depth to bedrock Too clayey Slope	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Too clayey Hard to compact Slope
Martin-----	30	Very limited: Restricted permeability Depth to saturated zone Slope	Very limited: Slope Depth to saturated zone	Very limited: Too clayey Depth to saturated zone Slope	Somewhat limited: Depth to saturated zone Slope	Very limited: Too clayey Hard to compact Depth to saturated zone Slope

Table 14.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7473: Padonia-----	55	Very limited: Restricted permeability Depth to bedrock	Very limited: Depth to soft bedrock Slope	Very limited: Depth to bedrock Too clayey	Very limited: Depth to bedrock	Very limited: Depth to bedrock Too clayey Hard to compact
Oska-----	40	Very limited: Restricted permeability Depth to bedrock	Very limited: Depth to hard bedrock Slope	Very limited: Depth to bedrock Too clayey	Very limited: Depth to bedrock	Very limited: Depth to bedrock Too clayey Hard to compact
7500: Pawnee-----	90	Very limited: Restricted permeability Depth to saturated zone	Somewhat limited: Depth to saturated zone Slope	Very limited: Too clayey Depth to saturated zone	Somewhat limited: Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
7502: Pawnee-----	85	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Slope	Very limited: Depth to saturated zone Too clayey	Very limited: Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Hard to compact
7504: Pawnee-----	85	Very limited: Restricted permeability Depth to saturated zone Slope	Very limited: Slope Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Slope	Very limited: Depth to saturated zone Slope	Very limited: Depth to saturated zone Too clayey Hard to compact Slope
7510: Pawnee, eroded-----	85	Very limited: Restricted permeability Depth to saturated zone	Somewhat limited: Slope Depth to saturated zone	Very limited: Too clayey Depth to saturated zone	Somewhat limited: Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
7515: Pawnee, eroded-----	84	Very limited: Restricted permeability Depth to saturated zone Slope	Very limited: Depth to saturated zone Slope	Very limited: Depth to saturated zone Too clayey Slope	Very limited: Depth to saturated zone Slope	Very limited: Depth to saturated zone Too clayey Hard to compact Slope

Table 14.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7585: Shelby-----	88	Very limited: Restricted permeability Slope	Very limited: Slope	Somewhat limited Too clayey Slope	Somewhat limited Slope	Somewhat limited: Too clayey Slope
7587: Shelby, eroded-----	85	Very limited: Restricted permeability Slope	Very limited: Slope	Very limited: Slope Too clayey	Very limited: Slope	Very limited: Slope Too clayey
7681: Wymore-----	90	Very limited: Restricted permeability Depth to saturated zone	Somewhat limited Depth to saturated zone	Very limited: Too clayey Depth to saturated zone	Somewhat limited Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
7683: Wymore-----	90	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Slope	Very limited: Depth to saturated zone Too clayey	Very limited: Depth to saturated zone	Very limited: Depth to saturated zone Too clayey Hard to compact
7688: Wymore-----	45	Very limited: Restricted permeability Depth to saturated zone	Somewhat limited Depth to saturated zone Slope	Very limited: Too clayey Depth to saturated zone	Somewhat limited Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
Baileyville--	40	Very limited: Restricted permeability Depth to saturated zone	Somewhat limited Depth to saturated zone Slope	Very limited: Too clayey Depth to saturated zone	Somewhat limited Depth to saturated zone	Very limited: Too clayey Hard to compact Depth to saturated zone
7750: Nodaway-----	90	Very limited: Flooding Depth to saturated zone Restricted permeability	Very limited: Flooding Depth to saturated zone Seepage	Very limited: Flooding Depth to saturated zone Too clayey	Very limited: Flooding Depth to saturated zone	Somewhat limited: Too clayey Depth to saturated zone
7851: Judson-----	95	Somewhat limited Restricted permeability	Somewhat limited Seepage Slope	Somewhat limited Too clayey	Not limited	Not limited

Table 14.--Sanitary Facilities--Continued

Map symbol and soil name	Pct. of map unit	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
7920: Contrary-----	85	Somewhat limited Restricted permeability	Very limited: Slope Seepage	Not limited	Not limited	Not limited
7965: Monona-----	90	Somewhat limited Restricted permeability	Somewhat limited Seepage Slope	Not limited	Not limited	Not limited
7966: Monona, eroded-----	82	Somewhat limited Restricted permeability	Very limited: Slope Seepage	Not limited	Not limited	Not limited
7981: Pohocco, eroded-----	50	Somewhat limited Slope Restricted permeability	Very limited: Slope Seepage	Somewhat limited Slope	Somewhat limited Slope	Somewhat limited: Slope
Netawaka-----	40	Somewhat limited Slope Restricted permeability	Very limited: Slope Seepage	Somewhat limited Slope	Somewhat limited Slope	Somewhat limited: Slope
7982: Pohocco-----	50	Very limited: Slope Restricted permeability	Very limited: Slope Seepage	Very limited: Slope	Very limited: Slope	Very limited: Slope
Netawaka-----	40	Very limited: Slope Restricted permeability	Very limited: Slope Seepage	Very limited: Slope	Very limited: Slope	Very limited: Slope
9971: Arents, earthen dam-	100	Not rated	Not rated	Not rated	Not rated	Not rated
9983: Gravel pits and quarries	100	Not rated	Not rated	Not rated	Not rated	Not rated
9986: Miscellaneous water-----	100	Not rated	Not rated	Not rated	Not rated	Not rated
9999: Water-----	100	Not rated	Not rated	Not rated	Not rated	Not rated

Table 15.--Agricultural Waste Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
4350: Chase-----	90	Very limited: Restricted permeability Depth to saturated zone	Very limited: Restricted permeability Depth to saturated zone Flooding	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Seepage Flooding	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability
4725: Kipson-----	60	Very limited: Depth to bedrock Slope Droughty Runoff	Very limited: Depth to bedrock Low adsorption Slope Droughty	Very limited: Depth to bedrock Too steep for surface application Too steep for sprinkler application Droughty	Very limited: Seepage Depth to bedrock Too steep for surface application	Very limited: Depth to bedrock Restricted permeability Slope	Very limited: Depth to bedrock Too steep for surface application Too steep for sprinkler application
Sogn-----	30	Very limited: Depth to bedrock Droughty Slope Runoff	Very limited: Droughty Depth to bedrock Low adsorption Slope	Very limited: Droughty Depth to bedrock Too steep for surface application Too steep for sprinkler application	Very limited: Seepage Depth to bedrock Too steep for surface application	Very limited: Depth to bedrock Restricted permeability Slope	Very limited: Depth to bedrock Too steep for surface application Too steep for sprinkler application
4832: Wamego-----	90	Very limited: Restricted permeability Depth to bedrock Droughty Too acid	Very limited: Restricted permeability Low adsorption Depth to bedrock Droughty Too acid	Very limited: Restricted permeability Depth to bedrock Droughty Too steep for surface application Too acid	Very limited: Seepage Depth to bedrock Too acid	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Restricted permeability Depth to bedrock Too steep for surface application Too acid
4834: Wamego-----	50	Very limited: Restricted permeability Depth to bedrock Droughty Slope Too acid	Very limited: Restricted permeability Low adsorption Depth to bedrock Droughty Too acid	Very limited: Restricted permeability Too steep for surface application Depth to bedrock Droughty Too steep for sprinkler application	Very limited: Seepage Depth to bedrock Too steep for surface application Too acid	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to bedrock Too steep for surface application Restricted permeability Too steep for sprinkler application Too acid

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
4834: Vinland-----	40	Very limited: Depth to bedrock Droughty Runoff Slope	Very limited: Depth to bedrock Low adsorption Droughty Slope	Very limited: Depth to bedrock Too steep for surface application Droughty Too steep for sprinkler application	Very limited: Seepage Depth to bedrock Too steep for surface application	Very limited: Depth to bedrock Slope	Very limited: Depth to bedrock Too steep for surface application Too steep for sprinkler application
7050: Kennebec-----	89	Somewhat limited Flooding Depth to saturated zone	Very limited: Flooding Depth to saturated zone	Somewhat limited Flooding Depth to saturated zone	Very limited: Flooding Seepage Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Flooding	Somewhat limited: Flooding Depth to saturated zone
7051: Kennebec, frequently flooded-----	85	Very limited: Flooding Depth to saturated zone	Very limited: Flooding Depth to saturated zone	Very limited: Flooding Depth to saturated zone	Very limited: Flooding Seepage Depth to saturated zone	Very limited: Flooding Depth to saturated zone Restricted permeability	Very limited: Flooding Depth to saturated zone
7060: Muscotah-----	87	Very limited: Restricted permeability Depth to saturated zone Flooding Runoff	Very limited: Restricted permeability Flooding Depth to saturated zone	Very limited: Restricted permeability Depth to saturated zone Flooding	Very limited: Flooding Seepage Depth to saturated zone	Very limited: Restricted permeability Depth to saturated zone Flooding	Very limited: Restricted permeability Depth to saturated zone Flooding
7061: Muscotah-----	87	Very limited: Restricted permeability Depth to saturated zone Flooding Runoff	Very limited: Restricted permeability Flooding Depth to saturated zone	Very limited: Restricted permeability Depth to saturated zone Flooding	Very limited: Flooding Depth to saturated zone Seepage	Very limited: Restricted permeability Depth to saturated zone Flooding	Very limited: Restricted permeability Depth to saturated zone Flooding

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
7091: Wabash-----	85	Very limited: Restricted permeability Depth to saturated zone Flooding Runoff Too acid	Very limited: Restricted permeability Depth to saturated zone Flooding Too acid	Very limited: Restricted permeability Depth to saturated zone Flooding Too acid	Very limited: Flooding Depth to saturated zone Too acid	Very limited: Restricted permeability Depth to saturated zone Flooding	Very limited: Depth to saturated zone Restricted permeability Flooding Too acid
7171: Reading-----	90	Somewhat limited Too acid	Somewhat limited Flooding Too acid	Somewhat limited Too acid	Very limited: Seepage Flooding Too acid	Very limited: Restricted permeability	Somewhat limited: Too acid
7205: Aksarben-----	90	Somewhat limited Restricted permeability Too acid	Somewhat limited Too acid Restricted permeability	Somewhat limited Too acid Restricted permeability	Very limited: Seepage Too acid	Very limited: Restricted permeability	Somewhat limited: Too acid Restricted permeability
7206: Aksarben-----	87	Somewhat limited Restricted permeability Too acid	Somewhat limited Too acid Restricted permeability	Somewhat limited Too acid Restricted permeability Too steep for surface application	Very limited: Seepage Too acid	Very limited: Restricted permeability	Somewhat limited: Too acid Restricted permeability Too steep for surface application
7207: Aksarben-----	85	Somewhat limited Restricted permeability Too acid	Somewhat limited Too acid Restricted permeability	Very limited: Too steep for surface application Too acid Restricted permeability Too steep for sprinkler application	Very limited: Seepage Too acid Too steep for surface application	Very limited: Restricted permeability Slope	Very limited: Too steep for surface application Too acid Too steep for sprinkler application Restricted permeability
7220: Burchard-----	85	Somewhat limited Restricted permeability Too acid Slope	Somewhat limited Restricted permeability Too acid Slope	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Too acid	Somewhat limited Seepage Too steep for surface application Too acid	Very limited: Restricted permeability Slope	Very limited: Too steep for surface application Too steep for sprinkler application Too acid Restricted permeability

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
7225: Burchard-----	55	Very limited: Slope Restricted permeability Too acid	Very limited: Slope Restricted permeability Too acid	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Too acid	Very limited: Too steep for surface application Seepage Too acid	Very limited: Slope Restricted permeability	Very limited: Too steep for surface application Too steep for sprinkler application Too acid Restricted permeability
Steinauer----	40	Very limited: Slope Restricted permeability	Very limited: Slope Restricted permeability	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability	Very limited: Too steep for surface application Seepage	Very limited: Slope Restricted permeability	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability
7255: Grundy-----	90	Very limited: Depth to saturated zone Restricted permeability Too acid	Very limited: Depth to saturated zone Restricted permeability Too acid	Very limited: Depth to saturated zone Restricted permeability Too acid	Very limited: Seepage Depth to saturated zone Too acid	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Too acid
7290: Marshall-----	97	Somewhat limited Too acid	Somewhat limited Too acid	Somewhat limited Too steep for surface application Too acid	Very limited: Seepage Too acid	Very limited: Restricted permeability	Somewhat limited: Too steep for surface application Too acid
7293: Marshall-----	82	Somewhat limited Too acid	Somewhat limited Too acid	Very limited: Too steep for surface application Too steep for sprinkler application Too acid	Very limited: Seepage Too steep for surface application Too acid	Very limited: Restricted permeability Slope	Very limited: Too steep for surface application Too steep for sprinkler application Too acid
7301: Martin-----	85	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Depth to saturated zone Seepage Too acid	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Too acid

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
7303: Martin-----	90	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Restricted permeability Depth to saturated zone Too steep for surface application Too acid	Very limited: Depth to saturated zone Seepage Too acid	Very limited: Restricted permeability Depth to saturated zone Slope	Very limited: Depth to saturated zone Restricted permeability Too steep for surface application Too acid Too steep for sprinkler application
7304: Martin-----	90	Very limited: Restricted permeability Depth to saturated zone Slope Too acid	Very limited: Restricted permeability Depth to saturated zone Too acid Slope	Very limited: Restricted permeability Too steep for surface application Depth to saturated zone Too acid	Very limited: Depth to saturated zone Seepage Too steep for surface application Too acid	Very limited: Restricted permeability Slope Depth to saturated zone	Very limited: Too steep for surface application Depth to saturated zone Restricted permeability Too steep for sprinkler application Too acid
7415: Mayberry-----	85	Very limited: Depth to saturated zone Restricted permeability Runoff Too acid	Very limited: Depth to saturated zone Restricted permeability Too acid	Very limited: Depth to saturated zone Restricted permeability Too acid Too steep for surface application	Very limited: Depth to saturated zone Seepage Too acid	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Too acid Too steep for surface application
7436: Morrill, eroded-----	87	Somewhat limited Restricted permeability Slope Too acid	Somewhat limited Restricted permeability Too acid Slope	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Too acid	Very limited: Seepage Too steep for surface application Too acid	Very limited: Restricted permeability Slope	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Too acid
7455: Olmitz-----	93	Somewhat limited Depth to saturated zone	Somewhat limited Depth to saturated zone	Somewhat limited Depth to saturated zone Too steep for surface application	Very limited: Seepage Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability	Somewhat limited: Depth to saturated zone Too steep for surface application

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
7470: Padonia-----	50	Very limited: Restricted permeability Depth to bedrock	Very limited: Low adsorption Restricted permeability Depth to bedrock	Very limited: Restricted permeability Too steep for surface application Depth to bedrock Too steep for sprinkler application	Very limited: Seepage Depth to bedrock Too steep for surface application	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to bedrock Restricted permeability Too steep for surface application Too steep for sprinkler application
Martin-----	40	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Restricted permeability Too steep for surface application Depth to saturated zone Too acid Too steep for sprinkler application	Very limited: Depth to saturated zone Seepage Too steep for surface application Too acid	Very limited: Restricted permeability Slope Depth to saturated zone	Very limited: Too steep for surface application Depth to saturated zone Restricted permeability Too steep for sprinkler application Too acid
7471: Padonia-----	60	Very limited: Restricted permeability Slope Depth to bedrock	Very limited: Low adsorption Restricted permeability Slope Depth to bedrock	Very limited: Too steep for surface application Restricted permeability Too steep for sprinkler application Depth to bedrock	Very limited: Seepage Depth to bedrock Too steep for surface application	Very limited: Slope Restricted permeability Depth to bedrock	Very limited: Depth to bedrock Too steep for surface application Too steep for sprinkler application Restricted permeability
Martin-----	30	Very limited: Restricted permeability Depth to saturated zone Slope Too acid	Very limited: Restricted permeability Depth to saturated zone Slope Too acid	Very limited: Restricted permeability Too steep for surface application Depth to saturated zone Too steep for sprinkler application Too acid	Very limited: Depth to saturated zone Too steep for surface application Seepage Too acid	Very limited: Restricted permeability Slope Depth to saturated zone	Very limited: Too steep for surface application Depth to saturated zone Too steep for sprinkler application Restricted permeability Too acid

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
7473: Padonia-----	55	Very limited: Restricted permeability Depth to bedrock	Very limited: Low adsorption Restricted permeability Depth to bedrock	Very limited: Restricted permeability Too steep for surface application Depth to bedrock Too steep for sprinkler application	Very limited: Seepage Depth to bedrock Too steep for surface application	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to bedrock Restricted permeability Too steep for surface application Too steep for sprinkler application
Oska-----	40	Very limited: Restricted permeability Depth to bedrock Too acid Droughty	Very limited: Low adsorption Restricted permeability Too acid Depth to bedrock Droughty	Very limited: Restricted permeability Too steep for surface application Too acid Depth to bedrock Too steep for sprinkler application	Very limited: Depth to bedrock Seepage Too acid Too steep for surface application	Very limited: Restricted permeability Depth to bedrock Slope	Very limited: Depth to bedrock Restricted permeability Too steep for surface application Too acid Too steep for sprinkler application
7500: Pawnee-----	90	Very limited: Restricted permeability Depth to saturated zone Runoff	Very limited: Restricted permeability Depth to saturated zone	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Seepage	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability
7502: Pawnee-----	85	Very limited: Depth to saturated zone Restricted permeability Runoff	Very limited: Depth to saturated zone Restricted permeability	Very limited: Depth to saturated zone Restricted permeability Too steep for surface application	Very limited: Depth to saturated zone Seepage	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Too steep for surface application
7504: Pawnee-----	85	Very limited: Depth to saturated zone Restricted permeability Runoff Slope	Very limited: Depth to saturated zone Restricted permeability Slope	Very limited: Depth to saturated zone Restricted permeability Too steep for surface application Too steep for sprinkler application	Very limited: Depth to saturated zone Seepage Too steep for surface application	Very limited: Restricted permeability Depth to saturated zone Slope	Very limited: Depth to saturated zone Too steep for surface application Restricted permeability Too steep for sprinkler application

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
7510: Pawnee, eroded-----	85	Very limited: Restricted permeability Depth to saturated zone Runoff	Very limited: Restricted permeability Depth to saturated zone	Very limited: Restricted permeability Depth to saturated zone Too steep for surface application	Very limited: Depth to saturated zone	Very limited: Restricted permeability Depth to saturated zone Slope	Very limited: Depth to saturated zone Restricted permeability Too steep for surface application
7515: Pawnee, eroded-----	84	Very limited: Depth to saturated zone Restricted permeability Runoff Slope	Very limited: Depth to saturated zone Restricted permeability Slope	Very limited: Depth to saturated zone Restricted permeability Too steep for surface application Too steep for sprinkler application	Very limited: Depth to saturated zone Too steep for surface application	Very limited: Restricted permeability Depth to saturated zone Slope	Very limited: Depth to saturated zone Too steep for surface application Restricted permeability Too steep for sprinkler application
7585: Shelby-----	88	Somewhat limited Restricted permeability Slope Too acid	Somewhat limited Restricted permeability Too acid Slope	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Too acid	Somewhat limited Seepage Too steep for surface application Too acid	Very limited: Restricted permeability Slope	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Too acid
7587: Shelby, eroded-----	85	Very limited: Slope Restricted permeability Too acid	Very limited: Slope Restricted permeability Too acid	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Too acid	Very limited: Too steep for surface application Seepage Too acid	Very limited: Slope Restricted permeability	Very limited: Too steep for surface application Too steep for sprinkler application Restricted permeability Too acid
7681: Wymore-----	90	Very limited: Restricted permeability Depth to saturated zone Runoff Too acid	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Depth to saturated zone Seepage Too acid	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Too acid

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
7683: Wymore-----	90	Very limited: Depth to saturated zone Restricted permeability Runoff Too acid	Very limited: Depth to saturated zone Restricted permeability Too acid	Very limited: Depth to saturated zone Restricted permeability Too acid Too steep for surface application	Very limited: Depth to saturated zone Seepage Too acid	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Too acid Too steep for surface application
7688: Wymore-----	45	Very limited: Restricted permeability Depth to saturated zone Runoff Too acid	Very limited: Restricted permeability Depth to saturated zone Too acid	Very limited: Restricted permeability Depth to saturated zone Too acid Too steep for surface application	Very limited: Depth to saturated zone Too acid Seepage	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Too acid Too steep for surface application
Baileyville--	40	Very limited: Restricted permeability Depth to saturated zone Runoff	Very limited: Restricted permeability Depth to saturated zone	Very limited: Restricted permeability Depth to saturated zone Too steep for surface application	Very limited: Depth to saturated zone Seepage	Very limited: Restricted permeability Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Too steep for surface application
7750: Nodaway-----	90	Somewhat limited: Flooding Depth to saturated zone	Very limited: Flooding Depth to saturated zone	Somewhat limited: Flooding Depth to saturated zone	Very limited: Flooding Seepage Depth to saturated zone	Very limited: Depth to saturated zone Restricted permeability Flooding	Somewhat limited: Flooding Depth to saturated zone
7851: Judson-----	95	Not limited	Not limited	Somewhat limited: Too steep for surface application	Very limited: Seepage	Very limited: Restricted permeability	Somewhat limited: Too steep for surface application
7920: Contrary-----	85	Not limited	Not limited	Somewhat limited: Too steep for surface application Too steep for sprinkler application	Very limited: Seepage Too steep for surface application	Very limited: Restricted permeability Slope	Somewhat limited: Too steep for surface application Too steep for sprinkler application

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
7965: Monona-----	90	Not limited	Not limited	Somewhat limited Too steep for surface application	Very limited: Seepage	Very limited: Restricted permeability	Somewhat limited: Too steep for surface application
7966: Monona, eroded-----	82	Not limited	Not limited	Very limited: Too steep for surface application Too steep for sprinkler application	Very limited: Seepage Too steep for surface application	Very limited: Restricted permeability Slope	Very limited: Too steep for surface application Too steep for sprinkler application
7981: Pohocco, eroded-----	50	Somewhat limited Slope	Somewhat limited Slope	Very limited: Too steep for surface application Too steep for sprinkler application	Very limited: Seepage Too steep for surface application	Very limited: Slope Restricted permeability	Very limited: Too steep for surface application Too steep for sprinkler application
Netawaka-----	40	Somewhat limited Slope	Somewhat limited Slope	Very limited: Too steep for surface application Too steep for sprinkler application	Very limited: Seepage Too steep for surface application	Very limited: Slope Restricted permeability	Very limited: Too steep for surface application Too steep for sprinkler application
7982: Pohocco-----	50	Very limited: Slope	Very limited: Slope	Very limited: Too steep for surface application Too steep for sprinkler application	Very limited: Seepage Too steep for surface application	Very limited: Slope Restricted permeability	Very limited: Too steep for surface application Too steep for sprinkler application
Netawaka-----	40	Very limited: Slope	Very limited: Slope	Very limited: Too steep for surface application Too steep for sprinkler application	Very limited: Seepage Too steep for surface application	Very limited: Slope Restricted permeability	Very limited: Too steep for surface application Too steep for sprinkler application
9971: Arents, earthen dam-	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9983: Gravel pits and quarries	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Table 15.--Agricultural Waste Management--Continued

Map symbol and soil name	Pct. of map unit	Application of manure and food- processing waste	Application of sewage sludge	Disposal of wastewater by irrigation	Overland flow of wastewater	Rapid infiltration of wastewater	Slow rate treatment of wastewater
9986: Miscellaneous water-----	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated
9999: Water-----	100	Not rated	Not rated	Not rated	Not rated	Not rated	Not rated

Table 16a.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for further explanation of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Potential source of gravel	Potential source of sand
4350: Chase-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4725: Kipson-----	60	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Sogn-----	30	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4832: Wamego-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
4834: Wamego-----	50	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Vinland-----	40	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7050: Kennebec-----	89	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7051: Kennebec, frequently flooded-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7060: Muscotah-----	87	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7061: Muscotah-----	87	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7091: Wabash-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer

Table 16a.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel	Potential source of sand
7171: Reading-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7205: Aksarben-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7206: Aksarben-----	87	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7207: Aksarben-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7220: Burchard-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7225: Burchard-----	55	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Steinauer-----	40	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7255: Grundy-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7290: Marshall-----	97	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7293: Marshall-----	82	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7301: Martin-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7303: Martin-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7304: Martin-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer

Table 16a.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel	Potential source of sand
7415: Mayberry-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7436: Morrill, eroded----	87	Poor: Bottom layer Thickest layer	Fair Thickest layer Bottom layer
7455: Olmitz-----	93	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7470: Padonia-----	50	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Martin-----	40	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7471: Padonia-----	60	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Martin-----	30	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7473: Padonia-----	55	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Oska-----	40	Not rated	Not rated
7500: Pawnee-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7502: Pawnee-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7504: Pawnee-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7510: Pawnee, eroded-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer

Table 16a.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel	Potential source of sand
7515: Pawnee, eroded-----	84	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7585: Shelby-----	88	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7587: Shelby, eroded-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7681: Wymore-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7683: Wymore-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7688: Wymore-----	45	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Baileyville-----	40	Not rated	Not rated
7750: Nodaway-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7851: Judson-----	95	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7920: Contrary-----	85	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7965: Monona-----	90	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7966: Monona, eroded-----	82	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer

Table 16a.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of gravel	Potential source of sand
7981:			
Pohocco, eroded-----	50	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Netawaka-----	40	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
7982:			
Pohocco-----	50	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
Netawaka-----	40	Poor: Bottom layer Thickest layer	Poor: Bottom layer Thickest layer
9971:			
Arents, earthen dam-----	100	Not rated	Not rated
9983:			
Gravel pits and quarries-----	100	Not rated	Not rated
9986:			
Miscellaneous water-	100	Not rated	Not rated
9999:			
Water-----	100	Not rated	Not rated

Table 16b.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
4350: Chase-----	90	Poor: Too clayey Low content of organic matter Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
4725: Kipson-----	60	Poor: Depth to bedrock Carbonate content Too alkaline Droughty Low content of organic matter	Poor: Depth to bedrock Low strength Slope Shrink-swell	Poor: Depth to bedrock Carbonate content Slope
Sogn-----	30	Poor: Droughty Depth to bedrock Too clayey	Poor: Depth to bedrock Low strength Shrink-swell	Poor: Depth to bedrock Slope Too clayey
4832: Wamego-----	90	Fair: Too clayey Depth to bedrock Droughty Water erosion Too acid	Poor: Depth to bedrock Shrink-swell	Fair: Too clayey Depth to bedrock
4834: Wamego-----	50	Fair: Too clayey Depth to bedrock Droughty Water erosion Too acid	Poor: Depth to bedrock Shrink-swell	Fair: Too clayey Depth to bedrock Slope
Vinland-----	40	Poor: Depth to bedrock Droughty Water erosion Too clayey	Poor: Depth to bedrock Low strength	Poor: Depth to bedrock Rock fragments Slope Too clayey
7050: Kennebec-----	89	Good	Poor: Low strength Shrink-swell	Good
7051: Kennebec, frequently flooded-----	85	Good	Poor: Low strength Shrink-swell	Good

Table 16b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
7060: Muscotah-----	87	Fair: Too clayey Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Fair: Depth to saturated zone Too clayey
7061: Muscotah-----	87	Poor: Too clayey Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
7091: Wabash-----	85	Poor: Too clayey Too acid	Poor: Depth to saturated zone Low strength Shrink-swell	Poor: Too clayey Depth to saturated zone
7171: Reading-----	90	Fair: Water erosion Too acid Too clayey	Poor: Low strength Shrink-swell	Fair: Too clayey
7205: Aksarben-----	90	Fair: Too clayey Low content of organic matter Too acid Water erosion	Poor: Low strength Shrink-swell	Fair: Too clayey
7206: Aksarben-----	87	Fair: Too clayey Too acid Water erosion	Poor: Low strength Shrink-swell	Fair: Too clayey
7207: Aksarben-----	85	Fair: Too clayey Too acid Water erosion	Poor: Low strength Shrink-swell	Fair: Too clayey
7220: Burchard-----	85	Fair: Low content of organic matter Too clayey Too acid Water erosion	Poor: Low strength Shrink-swell	Fair: Too clayey Slope

Table 16b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
7225: Burchard-----	55	Fair: Low content of organic matter Too clayey Too acid Water erosion	Poor: Low strength Shrink-swell	Poor: Slope Too clayey
Steinauer-----	40	Fair: Low content of organic matter Water erosion	Poor: Low strength Shrink-swell	Poor: Slope
7255: Grundy-----	90	Poor: Too clayey Low content of organic matter Water erosion Too acid	Poor: Low strength Depth to saturated zone Shrink-swell	Poor: Too clayey Depth to saturated zone
7290: Marshall-----	97	Fair: Low content of organic matter Water erosion Too acid	Poor: Low strength Shrink-swell	Good
7293: Marshall-----	82	Fair: Low content of organic matter Water erosion Too acid	Poor: Low strength Shrink-swell	Good
7301: Martin-----	85	Poor: Too clayey Too acid Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
7303: Martin-----	90	Poor: Too clayey Low content of organic matter Too acid Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
7304: Martin-----	90	Poor: Too clayey Low content of organic matter Too acid Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone Slope

Table 16b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
7415: Mayberry-----	85	Poor: Too clayey Low content of organic matter Too acid Water erosion	Poor: Depth to saturated zone Low strength Shrink-swell	Poor: Too clayey Depth to saturated zone
7436: Morrill, eroded----	87	Fair: Low content of organic matter Too acid	Poor: No shrink-swell	Fair: Rock fragments Slope
7455: Olmitz-----	93	Fair: Too acid Too clayey	Poor: Low strength Shrink-swell	Fair: Too clayey
7470: Padonia-----	50	Poor: Too clayey Water erosion Depth to bedrock	Poor: Depth to bedrock Low strength Shrink-swell	Poor: Too clayey Depth to bedrock
Martin-----	40	Poor: Too clayey Too acid Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
7471: Padonia-----	60	Poor: Too clayey Water erosion Depth to bedrock	Poor: Depth to bedrock Low strength Shrink-swell Slope	Poor: Too clayey Slope Depth to bedrock
Martin-----	30	Poor: Too clayey Too acid Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone Slope
7473: Padonia-----	55	Poor: Too clayey Water erosion Depth to bedrock	Poor: Depth to bedrock Low strength Shrink-swell	Poor: Too clayey Depth to bedrock
Oska-----	40	Poor: Too clayey Low content of organic matter Depth to bedrock Too acid Water erosion	Poor: Depth to bedrock Low strength Shrink-swell	Poor: Too clayey Rock fragments Depth to bedrock

Table 16b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
7500: Pawnee-----	90	Poor: Too clayey Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
7502: Pawnee-----	85	Poor: Too clayey Low content of organic matter Water erosion	Poor: Low strength Depth to saturated zone Shrink-swell	Poor: Too clayey Depth to saturated zone
7504: Pawnee-----	85	Poor: Too clayey Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone Slope
7510: Pawnee, eroded-----	85	Poor: Too clayey Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
7515: Pawnee, eroded-----	84	Poor: Too clayey Low content of organic matter Water erosion	Poor: Low strength Depth to saturated zone Shrink-swell	Poor: Too clayey Depth to saturated zone Slope
7585: Shelby-----	88	Fair: Too clayey Low content of organic matter Too acid Water erosion	Poor: Low strength Shrink-swell	Fair: Too clayey Slope
7587: Shelby, eroded-----	85	Fair: Too clayey Low content of organic matter Too acid Water erosion	Poor: Low strength Shrink-swell	Poor: Slope Too clayey
7681: Wymore-----	90	Poor: Too clayey Water erosion Too acid	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone

Table 16b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
7683: Wymore-----	90	Poor: Too clayey Too acid	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
7688: Wymore-----	45	Poor: Too clayey Too acid Water erosion	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
Baileyville-----	40	Poor: Too clayey Low content of organic matter Water erosion Too acid	Poor: Low strength Shrink-swell Depth to saturated zone	Poor: Too clayey Depth to saturated zone
7750: Nodaway-----	90	Fair: Low content of organic matter Water erosion	Poor: Low strength Shrink-swell	Good
7851: Judson-----	95	Fair: Low content of organic matter Water erosion	Poor: Low strength Shrink-swell	Good
7920: Contrary-----	85	Fair: Low content of organic matter Water erosion	Poor: Low strength Shrink-swell	Good
7965: Monona-----	90	Fair: Low content of organic matter Water erosion	Poor: Low strength Shrink-swell	Good
7966: Monona, eroded-----	82	Fair: Low content of organic matter Water erosion	Poor: Low strength Shrink-swell	Good
7981: Pohocco, eroded-----	50	Fair: Low content of organic matter Water erosion	Poor: Low strength Shrink-swell	Fair: Slope

Table 16b.--Construction Materials--Continued

Map symbol and soil name	Pct. of map unit	Potential source of reclamation material	Potential source of roadfill	Potential source of topsoil
7981: Netawaka-----	40	Fair: Low content of organic matter Water erosion	Poor: Low strength	Fair: Slope
7982: Pohocco-----	50	Fair: Low content of organic matter Water erosion	Poor: Low strength Slope Shrink-swell	Poor: Slope
Netawaka-----	40	Fair: Low content of organic matter Water erosion	Poor: Low strength Slope	Poor: Slope
9971: Arents, earthen dam-----	100	Not rated	Not rated	Not rated
9983: Gravel pits and quarries-----	100	Not rated	Not rated	Not rated
9986: Miscellaneous water-	100	Not rated	Not rated	Not rated
9999: Water-----	100	Not rated	Not rated	Not rated

Table 17.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table.)

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
4350: Chase-----	90	Not limited	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
4725: Kipson-----	60	Somewhat limited Depth to bedrock Slope	Somewhat limited Piping	Very limited: No ground water
Sogn-----	30	Very limited: Depth to bedrock Slope	Very limited: Thin layer Piping	Very limited: No ground water
4832: Wamego-----	90	Somewhat limited Depth to bedrock	Somewhat limited Piping	Very limited: No ground water
4834: Wamego-----	50	Somewhat limited Depth to bedrock	Somewhat limited Piping	Very limited: No ground water
Vinland-----	40	Somewhat limited Depth to bedrock	Somewhat limited Piping	Very limited: No ground water
7050: Kennebec-----	89	Somewhat limited Seepage	Somewhat limited Piping Depth to saturated zone	Somewhat limited: Depth to water Slow refill Cutbanks cave
7051: Kennebec, frequently flooded-----	85	Somewhat limited Seepage	Somewhat limited Piping Depth to saturated zone	Somewhat limited: Depth to water Slow refill Cutbanks cave
7060: Muscotah-----	87	Somewhat limited Seepage	Very limited: Depth to saturated zone Hard to pack	Somewhat limited: Slow refill Cutbanks cave

Table 17.--Water Management--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
7061: Muscotah-----	87	Somewhat limited Seepage	Very limited: Depth to saturated zone Hard to pack	Very limited: Slow refill Cutbanks cave
7091: Wabash-----	85	Not limited	Very limited: Depth to saturated zone Hard to pack	Very limited: Slow refill Cutbanks cave
7171: Reading-----	90	Somewhat limited Seepage	Not limited	Very limited: No ground water
7205: Aksarben-----	90	Somewhat limited Seepage	Not limited	Very limited: No ground water
7206: Aksarben-----	87	Somewhat limited Seepage	Not limited	Very limited: No ground water
7207: Aksarben-----	85	Somewhat limited Seepage	Not limited	Very limited: No ground water
7220: Burchard-----	85	Somewhat limited Seepage	Somewhat limited Piping	Very limited: No ground water
7225: Burchard-----	55	Somewhat limited Seepage Slope	Not limited	Very limited: No ground water
Steinauer----	40	Somewhat limited Seepage Slope	Somewhat limited	Very limited: No ground water
7255: Grundy-----	90	Not limited	Very limited: Depth to saturated zone	Very limited: No ground water
7290: Marshall-----	97	Somewhat limited Seepage	Somewhat limited Piping	Very limited: No ground water
7293: Marshall-----	82	Somewhat limited Seepage	Somewhat limited Piping	Very limited: No ground water

Table 17.--Water Management--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
7301: Martin-----	85	Not limited	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7303: Martin-----	90	Not limited	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7304: Martin-----	90	Somewhat limited Seepage	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7415: Mayberry-----	85	Not limited	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7436: Morrill, eroded-----	87	Very limited: Seepage	Not limited	Very limited: No ground water
7455: Olmitz-----	93	Somewhat limited Seepage	Somewhat limited Depth to saturated zone	Somewhat limited: Depth to water Slow refill Cutbanks cave
7470: Padonia-----	50	Somewhat limited Seepage Depth to bedrock	Not limited	Very limited: No ground water
Martin-----	40	Not limited	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7471: Padonia-----	60	Somewhat limited Slope Seepage Depth to bedrock	Not limited	Very limited: No ground water
Martin-----	30	Somewhat limited Slope	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water

Table 17.--Water Management--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
7473: Padonia-----	55	Somewhat limited Seepage Depth to bedrock	Not limited	Very limited: No ground water
Oska-----	40	Somewhat limited Depth to bedrock	Somewhat limited Thin layer Hard to pack	Very limited: No ground water
7500: Pawnee-----	90	Not limited	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7502: Pawnee-----	85	Not limited	Very limited: Depth to saturated zone	Very limited: No ground water
7504: Pawnee-----	85	Not limited	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7510: Pawnee, eroded-----	85	Not limited	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7515: Pawnee, eroded-----	84	Not limited	Very limited: Depth to saturated zone	Very limited: No ground water
7585: Shelby-----	88	Somewhat limited Seepage	Not limited	Very limited: No ground water
7587: Shelby, eroded-----	85	Somewhat limited Seepage Slope	Not limited	Very limited: No ground water
7681: Wymore-----	90	Somewhat limited Seepage	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water

Table 17.--Water Management--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
7683: Wymore-----	90	Somewhat limited Seepage	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7688: Wymore-----	45	Somewhat limited Seepage	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
Baileyville--	40	Somewhat limited Seepage	Very limited: Depth to saturated zone Hard to pack	Very limited: No ground water
7750: Nodaway-----	90	Somewhat limited Seepage	Somewhat limited Piping Depth to saturated zone	Somewhat limited: Slow refill Depth to water Cutbanks cave
7851: Judson-----	95	Somewhat limited Seepage	Somewhat limited Piping	Very limited: No ground water
7920: Contrary-----	85	Somewhat limited Seepage	Somewhat limited Piping	Very limited: No ground water
7965: Monona-----	90	Somewhat limited Seepage	Somewhat limited Piping	Very limited: No ground water
7966: Monona, eroded-----	82	Somewhat limited Seepage	Somewhat limited Piping	Very limited: No ground water
7981: Pohocco, eroded-----	50	Somewhat limited Seepage Slope	Somewhat limited Piping	Very limited: No ground water
Netawaka----	40	Somewhat limited Seepage Slope	Very limited: Piping	Very limited: No ground water
7982: Pohocco-----	50	Somewhat limited Seepage Slope	Somewhat limited Piping	Very limited: No ground water
Netawaka----	40	Somewhat limited Seepage Slope	Very limited: Piping	Very limited: No ground water

Table 17.--Water Management--Continued

Map symbol and soil name	Pct. of map unit	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds
9971: Arents, earthen dam	100	Not rated	Not rated	Not rated
9983: Gravel pits and quarries	100	Not rated	Not rated	Not rated
9986: Miscellaneous water-----	100	Not rated	Not rated	Not rated
9999: Water-----	100	Not rated	Not rated	Not rated

(Absence of an entry indicates that the data were not estimated.)

[illegible]

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
4834: Vinland-----	0-8	Silty clay loam, silt loam, channery silty clay loam, channery silt loam	CL, CH	A-6, A-7	0	0-4	82-100	59-100	55-100	53-100	39-53	17-25
	8-12	Silty clay loam, silt loam, fine sandy loam, loam, channery silty clay loam, channery silt loam, channery fine sandy loam, channery loam	CL	A-6, A-7	0	0	91-100	69-100	60-100	58-100	26-47	10-25
	12-19	Silty clay loam, silt loam, fine sandy loam, loam, channery silty clay loam, channery silt loam, channery fine sandy loam, channery loam	CL	A-6, A-7	0	0	91-100	69-100	60-100	58-100	26-47	10-25
	19-23	Weathered bedrock	---	---	---	---	---	---	---	---	---	---
7050: Kennebec-----	0-8	Silt loam, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	43-53	15-21
	8-18	Silt loam, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	43-53	15-21
	18-32	Silt loam, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	43-53	15-21
	32-41	Silt loam, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	43-53	15-21
	41-54	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	90-100	36-45	16-21
	54-60	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	90-100	36-45	16-21

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
							4	10	40	200		
	In				Pct	Pct					Pct	
7051: Kennebec, frequently flooded-----												
	0-8	Silt loam, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	43-53	15-21
	8-18	Silt loam, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	43-53	15-21
	18-32	Silt loam, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	43-53	15-21
	32-41	Silt loam, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	43-53	15-21
	41-54	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	90-100	36-45	16-21
	54-60	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	90-100	36-45	16-21
7060: Muscotah-----												
	0-9	Silt loam	CL	A-6, A-4	0	0	100	95-100	95-100	90-100	28-36	9-16
	9-16	Stratified silt loam to silty clay loam	CL	A-6, A-4	0	0	100	95-100	95-100	90-100	28-39	9-18
	16-30	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	45-55	25-35
	30-39	Silty clay, silty clay loam	CH	A-7	0	0	100	100	95-100	85-95	51-66	29-41
	39-61	Silty clay, silty clay loam	CH	A-7	0	0	100	100	95-100	85-95	51-66	29-41
	61-70	Silty clay, silty clay loam	CH	A-7	0	0	100	100	95-100	85-95	51-66	29-41
	70-80	Silty clay, silty clay loam	CH	A-7	0	0	100	100	95-100	85-95	51-66	29-41
7061: Muscotah-----												
	0-9	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	85-95	45-55	25-35
	9-16	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	45-55	25-35
	16-23	Silty clay loam	CL	A-7	0	0	100	100	95-100	85-95	36-48	16-25
	23-35	Silty clay loam, silty clay	CH	A-7	0	0	100	100	95-100	85-95	51-66	29-41
	35-44	Silty clay, silty clay loam	CH	A-7	0	0	100	100	95-100	85-95	51-66	29-41
	44-60	Silty clay, silty clay loam	CH	A-7	0	0	100	100	95-100	85-95	51-66	29-41
	60-70	Silty clay, silty clay loam	CH	A-7	0	0	100	100	95-100	85-95	51-66	29-41
	70-80	Silty clay, silty clay loam	CH	A-7	0	0	100	100	95-100	85-95	51-66	29-41

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
7091:												
Wabash-----	0-7	Silty clay	CH	A-7	0	0	100	100	100	95-100	55-65	29-33
	7-15	Silty clay	CH	A-7	0	0	100	100	100	95-100	55-69	29-36
	15-80	Silty clay, clay	CH	A-7	0	0	100	100	100	95-100	53-75	29-44
7171:												
Reading-----	0-9	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	80-90	35-47	13-19
	9-18	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	80-90	35-47	13-19
	18-48	Silty clay loam	CL, CH	A-6, A-7	0	0	100	100	95-100	85-95	38-51	19-25
	48-54	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	85-95	38-49	19-25
	54-80	Silty clay loam, silt loam	CL	A-7, A-6	0	0	100	100	95-100	80-95	35-46	17-25
7205:												
Aksarben-----	0-9	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	42-54	19-25
	9-13	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	90-100	42-54	19-25
	13-19	Silty clay loam	CL	A-7, A-6	0	0	100	100	95-100	90-100	38-48	19-25
	19-39	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	90-100	46-55	25-30
	39-47	Silty clay loam	CL	A-7, A-6	0	0	100	100	95-100	90-100	38-47	19-25
	47-80	Silty clay loam, silt loam	CL	A-6, A-7	0	0	100	100	95-100	85-95	35-44	17-23
7206:												
Aksarben-----	0-6	Silty clay loam, silt loam	CL, CH	A-7, A-6	0	0	100	100	95-100	90-100	39-54	17-25
	6-12	Silty clay loam, silt loam	CL, CH	A-7, A-6	0	0	100	100	95-100	90-100	39-52	17-25
	12-42	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	90-100	47-57	25-30
	42-60	Silty clay loam	CL	A-7, A-6	0	0	100	100	95-100	90-100	39-49	19-25
	60-80	Silty clay loam, silt loam	CL	A-6, A-7	0	0	100	100	95-100	85-95	35-44	17-23
7207:												
Aksarben-----	0-6	Silty clay loam, silt loam	CL, CH	A-6, A-7	0	0	100	100	95-100	90-100	39-54	17-25
	6-10	Silty clay loam, silt loam	CL, CH	A-6, A-7	0	0	100	100	95-100	90-100	39-52	17-25
	10-40	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	90-100	47-57	25-30
	40-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	95-100	90-100	39-49	19-25
	60-80	Silty clay loam, silt loam	CL	A-6, A-7	0	0	100	100	95-100	85-95	35-44	17-23

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
7220:												
Burchard-----	0-9	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	95-100	85-95	60-80	35-49	13-21
	9-13	Clay loam, loam	CL	A-7, A-6	0	0-5	95-100	95-100	85-95	60-80	39-49	17-24
	13-19	Clay loam	CL	A-6, A-7	0	0-5	95-100	85-100	75-95	65-80	38-49	19-27
	19-29	Clay loam	CL	A-7, A-6	0	0-5	95-100	85-100	75-95	65-80	38-49	19-27
	29-37	Clay loam, loam	CL	A-7, A-6	0	0-5	95-100	85-100	75-95	65-80	31-42	13-21
	37-60	Clay loam, loam	CL	A-6, A-7	0	0-5	95-100	85-100	75-95	60-80	30-41	13-21
7225:												
Burchard-----	0-9	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	95-100	85-95	60-80	35-49	13-21
	9-19	Clay loam	CL	A-6, A-7	0	0-5	95-100	85-100	75-95	65-80	38-49	19-27
	19-29	Clay loam	CL	A-7, A-6	0	0-5	95-100	85-100	75-95	65-80	38-49	19-27
	29-37	Loam, clay loam	CL	A-7, A-6	0	0-5	95-100	85-100	75-95	65-80	31-42	13-21
	37-60	Clay loam, loam	CL	A-6, A-7	0	0-5	95-100	85-100	75-95	60-80	30-41	13-21
Steinauer-----	0-6	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	95-100	85-100	55-90	36-49	17-25
	6-14	Clay loam	CL	A-6, A-7	0	0-5	95-100	95-100	90-100	70-90	38-47	19-25
	14-80	Loam, clay loam	CL	A-6, A-7	0	0-5	95-100	95-100	90-100	60-75	29-46	12-25
7255:												
Grundy-----	0-7	Silt loam, silty clay loam	CL, CH	A-6, A-7	0	0	100	100	95-100	90-100	39-57	16-27
	7-14	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	90-100	40-59	19-30
	14-41	Silty clay	CH	A-7	0	0	100	100	95-100	90-100	53-61	31-35
	41-48	Silty clay loam, silty clay	CL, CH	A-7	0	0	100	100	90-100	90-100	43-54	23-31
	48-80	Silty clay loam	CL	A-7, A-6	0	0	100	100	90-100	90-100	38-47	19-25
7290:												
Marshall-----	0-10	Silt loam	CL	A-7	0	0	100	100	100	95-100	42-48	17-21
	10-13	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-47	19-22
	10-32	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	38-47	19-25
	32-80	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-43	17-23
7293:												
Marshall-----	0-10	Silt loam	CL	A-7	0	0	100	100	100	95-100	42-48	17-21
	10-13	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-47	19-22
	10-32	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	38-47	19-25
	32-80	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-43	17-23
7301:												
Martin-----	0-6	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	42-58	19-28
	6-12	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	40-54	19-28
	12-53	Silty clay, clay	CH	A-7	0	0	100	100	90-100	75-95	52-70	29-40
	53-80	Silty clay, clay, silty clay loam	CH, CL	A-7	0	0	100	100	95-100	75-95	46-57	25-33

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
7303:												
Martin-----	0-6	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	42-59	19-29
	6-12	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	41-55	19-29
	12-53	Silty clay, clay	CH	A-7	0	0	100	100	90-100	75-95	52-68	29-41
	53-80	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	75-95	41-54	21-31
7304:												
Martin-----	0-6	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	42-59	19-29
	6-14	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	42-58	19-29
	14-24	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	41-55	19-29
	24-53	Silty clay, clay	CH	A-7	0	0	100	100	90-100	75-95	52-68	29-41
	53-80	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	75-95	41-54	21-31
7415:												
Mayberry-----	0-10	Clay loam	CL, CH	A-6, A-7	0	0	100	95-100	90-100	75-100	40-57	19-29
	10-42	Clay, sandy clay	CH	A-7	0	0	100	90-100	80-100	60-100	52-63	29-37
	42-80	Clay loam, stratified sandy loam to clay	CH, CL	A-6, A-7	0	0	95-100	95-100	85-100	70-95	28-57	12-33
7436:												
Morrill, eroded-	0-6	Loam, clay loam	CL	A-6, A-4, A-7	0	0	95-100	75-100	65-100	50-80	28-44	9-19
	6-12	Clay loam, loam	CL	A-7, A-6	0	0	95-100	75-100	65-100	50-80	34-46	15-22
	12-22	Loam, sandy clay loam, gravelly clay loam, gravelly sandy clay loam, clay loam	CL, SC	A-7, A-6	0	0	85-100	70-100	55-100	25-80	33-47	15-25
	22-43	Clay loam, sandy clay loam, gravelly clay loam, gravelly sandy clay loam	CL, SC	A-7, A-6	0	0	85-100	70-100	55-100	25-80	33-47	15-25
	43-80	Loam, fine sandy loam, clay loam, sandy clay loam, sandy loam, gravelly sandy clay loam, gravelly sandy loam, gravelly clay loam, stratified fine sandy loam to loamy fine sand to sand	SC-SM, SC, CL-ML, CL	A-4, A-6, A- 2-4	0	0	90-100	70-100	45-85	25-55	0-42	NP-21

[illegible]

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
7473:												
Oska-----	0-5	Silty clay loam	CL, CH	A-6, A-7	0	0	100	100	95-100	90-100	40-57	19-29
	5-11	Clay, silty clay, silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	48-65	25-37
	11-35	Silty clay, gravelly silty clay, gravelly silty clay loam	CH, CL	A-7	---	0-5	85-100	65-100	60-100	55-100	47-63	25-37
	35-39	Unweathered bedrock	---	---	---	---	---	---	---	---	---	---
7500:												
Pawnee-----	0-8	Clay loam	CL, CH	A-7	0	0	95-100	95-100	85-100	70-90	44-56	21-27
	8-15	Clay loam, clay	CH, CL	A-7	0	0	95-100	95-100	85-100	70-90	42-58	21-30
	15-41	Clay	CH	A-7	0	0	95-100	95-100	85-100	70-85	50-64	29-36
	41-51	Clay, clay loam	CL, CH	A-7	0	0	95-100	95-100	85-100	70-85	46-58	25-33
	51-60	Clay loam, sandy clay loam	CL	A-6, A-7	0	0	95-100	95-100	80-100	70-90	35-49	17-27
7502:												
Pawnee-----	0-7	Clay loam	CL, CH	A-7	0	0	95-100	95-100	85-100	70-90	45-57	21-27
	7-12	Clay loam	CL, CH	A-7	0	0	95-100	95-100	85-100	70-90	43-53	21-27
	12-48	Clay	CH	A-7	0	0	95-100	95-100	85-100	70-85	52-61	29-35
	48-80	Clay loam, sandy clay loam	CL	A-6, A-7	0	0	95-100	95-100	80-100	70-90	35-47	17-25
7504:												
Pawnee-----	0-7	Clay loam	CL, CH	A-7	0	0	95-100	95-100	85-100	70-90	45-57	21-27
	7-12	Clay loam	CL, CH	A-7	0	0	95-100	95-100	85-100	70-90	43-53	21-27
	12-48	Clay	CH	A-7	0	0	95-100	95-100	85-100	70-85	52-62	29-35
	48-80	Clay loam, sandy clay loam	CH, CL	A-6, A-7	0	0	95-100	95-100	80-100	70-90	36-52	17-29
7510:												
Pawnee, eroded--	0-6	Clay loam, clay	CL, CH	A-7	0	0	95-100	95-100	85-100	70-90	47-57	25-30
	6-39	Clay	CH	A-7	0	0	95-100	95-100	85-100	70-85	50-64	29-36
	39-51	Clay, clay loam	CH, CL	A-7	0	0	95-100	95-100	85-100	70-85	46-58	25-33
	51-60	Clay loam, sandy clay loam	CL	A-6, A-7	0	0	95-100	95-100	80-100	70-90	35-49	17-27
7515:												
Pawnee, eroded--	0-5	Clay	CH	A-7	0	0	95-100	95-100	85-100	70-85	53-61	29-33
	5-45	Clay	CH	A-7	0	0	95-100	95-100	85-100	70-85	52-61	29-35
	45-80	Clay loam, sandy clay loam	CL	A-6, A-7	0	0	95-100	95-100	80-100	70-90	35-47	17-25
7585:												
Shelby-----	0-13	Clay loam, loam	CL	A-6, A-7	0	0	90-95	85-95	75-90	55-70	35-49	13-22
	13-36	Clay loam	CL	A-7	0	0-5	90-95	85-95	75-90	55-70	43-49	23-27
	36-48	Clay loam	CL	A-6, A-7	0	0-5	90-95	85-95	75-90	55-70	41-47	21-25
	48-80	Clay loam, loam	CL	A-6, A-7	0	0-5	90-95	85-95	75-90	55-70	35-43	17-23

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches						
					4	10	40	200				
	In				Pct	Pct					Pct	
7587:												
Shelby, eroded--	0-8	Clay loam	CL	A-7	0	0	90-95	85-95	75-90	55-70	40-49	19-22
	8-45	Clay loam	CL	A-7	0	0-5	90-95	85-95	75-90	55-70	43-50	23-27
	36-48	Clay loam	CL	A-6, A-7	0	0-5	90-95	85-95	75-90	55-70	41-47	21-25
	45-80	Clay loam, loam	CL	A-6, A-7	0	0-5	90-95	85-95	75-90	55-70	35-43	17-23
7681:												
Wymore-----	0-8	Silty clay loam, silt loam	CH, CL	A-7	0	0	100	100	90-100	70-95	41-57	18-27
	8-11	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	85-95	45-57	23-29
	11-37	Silty clay	CH	A-7	0	0	100	100	95-100	90-95	53-69	29-40
	37-45	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	85-95	47-59	25-33
	45-51	Silty clay loam, silty clay	CL, CH	A-7	0	0	100	100	95-100	85-95	43-53	23-29
	51-79	Silty clay loam, silt loam	CL	A-7, A-6	0	0	100	100	90-100	70-95	36-48	17-26
7683:												
Wymore-----	0-7	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	42-59	19-29
	7-12	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	95-100	43-60	21-33
	12-39	Silty clay	CH	A-7	0	0	100	100	95-100	95-100	52-69	29-40
	39-47	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-100	41-53	21-29
	47-80	Silty clay loam	CL	A-7, A-6	0	0	100	100	95-100	85-100	38-50	19-27
7688:												
Wymore-----	0-6	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	85-95	46-61	23-31
	6-34	Silty clay	CH	A-7	0	0	100	100	95-100	90-95	54-69	31-40
	34-42	Silty clay, silty clay loam	CL, CH	A-7	0	0	100	100	95-100	85-95	47-59	25-33
	42-53	Silty clay loam, silty clay	CH, CL	A-7	0	0	100	100	95-100	85-95	43-53	23-29
	53-79	Silty clay loam, silt loam	CL	A-6, A-7	0	0	100	100	90-100	70-95	36-48	17-26

Table 18.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
7688: Baileyville-----	0-6	Silty clay, silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	44-63	23-32
	6-19	Silty clay	CH	A-7	0	0	100	100	95-100	90-95	53-70	29-40
	19-32	Silty clay, silty clay loam	CH, CL	A-7	0	0	100	100	95-100	85-95	47-59	25-33
	32-36	Silty clay loam	CL	A-7, A-6	0	0	100	100	95-100	85-95	39-49	19-25
	36-43	Silty clay loam, silty clay	CL, CH	A-7	0	0	100	100	95-100	85-95	41-57	21-33
	43-48	Clay loam, clay, silty clay	CL, CH	A-7	0	0	95-100	95-100	86-100	66-95	40-57	21-33
	48-76	Clay, silty clay, clay loam	CH, CL	A-7	---	0	95-100	95-100	86-100	66-95	45-71	25-44
7750: Nodaway-----	0-7	Silt loam	CL	A-7, A-6	0	0	100	95-100	95-100	90-100	33-43	12-19
	7-14	Stratified silt loam, stratified silt loam to silty clay loam	CL	A-7, A-6	0	0	100	95-100	95-100	90-100	29-41	12-21
	14-45	Stratified silt loam, stratified silt loam to silty clay loam	CL	A-7, A-6	0	0	100	95-100	95-100	90-100	29-41	12-21
	45-60	Stratified silt loam, stratified silt loam to silty clay loam	CL	A-7, A-6	0	0	100	95-100	95-100	90-100	29-41	12-21
7851: Judson-----	0-7	Silt loam	CL	A-7	0	0	100	100	100	95-100	43-48	16-18
	7-25	Silt loam, silty clay loam	CL	A-7	0	0	100	100	100	95-100	42-48	17-21
	25-40	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	41-48	19-22
	40-50	Silty clay loam	CL	A-7, A-6	0	0	100	100	100	95-100	39-49	19-25
	50-80	Silty clay loam, silt loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-44	17-23
7920: Contrary-----	0-6	Silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	85-90	38-49	19-25
	6-32	Silt loam, silty clay loam	CL	A-6, A-7	0	0	100	100	90-100	85-95	31-42	13-21
	32-80	Silt loam	CL	A-6	0	0	100	100	90-100	85-90	29-38	12-19

Table 18.--Engineering Index Properties--Continued

[illegible]

Table 19.--Physical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
4350:														
Chase-----	0-9	2-15	45-70	27-35	1.30-1.40	0.2-0.6	0.21-0.23	4.6-6.7	2.0-4.0	.37	.37	5	7	38
	9-19	2-15	45-70	27-40	1.30-1.40	0.2-0.6	0.18-0.20	4.6-7.9	2.0-4.0	.37	.37			
	19-41	2-15	35-60	35-55	1.35-1.45	0.06-0.2	0.11-0.19	6.7-11.7	1.0-3.0	.28	.28			
	41-47	2-15	40-60	27-55	1.35-1.45	0.06-0.2	0.11-0.18	4.6-11.7	0.5-1.0	.28	.28			
	47-80	2-15	40-60	27-50	1.35-1.45	0.06-0.2	0.11-0.18	4.6-10.4	0.5-1.0	.28	.28			
4725:														
Kipson-----	0-8	2-30	45-70	25-35	1.30-1.40	0.6-2	0.17-0.20	3.7-5.8	1.0-3.0	.32	.49	2	4L	86
	8-19	2-30	45-75	18-35	1.35-1.50	0.6-2	0.15-0.20	2.2-5.8	0.5-1.0	.32	.43			
	19-22	---	---	---	---	---	---	---	---	---	---			
Sogn-----	0-12	2-20	55-75	27-35	1.35-1.45	0.6-2	0.21-0.23	4.1-5.8	1.0-3.0	.32	.32	1	4L	86
	12-16	---	---	---	---	---	---	---	---	---	---			
4832:														
Wamego-----	0-9	2-10	55-70	27-32	1.30-1.40	0.6-2	0.21-0.23	4.1-5.1	2.0-4.0	.32	.32	3	7	38
	9-20	2-22	50-65	35-42	1.50-1.70	0.06-0.2	0.12-0.20	5.8-7.2	1.0-2.0	.43	.43			
	20-25	2-22	50-65	35-42	1.50-1.70	0.06-0.2	0.12-0.20	5.8-7.2	0.5-1.0	.43	.43			
	25-36	---	---	---	---	0.0000-0.0015	---	---	---	---	---			
4834:														
Wamego-----	0-9	2-10	55-70	27-32	1.30-1.40	0.6-2	0.21-0.23	4.1-5.1	2.0-4.0	.32	.32	3	6	48
	9-20	2-22	50-65	35-42	1.50-1.70	0.06-0.2	0.12-0.20	5.8-7.2	1.0-2.0	.43	.43			
	20-25	2-22	50-65	35-42	1.50-1.70	0.06-0.2	0.12-0.20	5.8-7.2	0.5-1.0	.43	.43			
	25-36	---	---	---	---	---	---	---	---	---	---			
Vinland-----	0-8	2-55	60-70	25-35	1.20-1.40	0.6-2	0.21-0.24	3.7-5.8	2.0-4.0	.32	.32	2	6	48
	8-12	2-55	48-80	15-35	1.30-1.60	0.6-2	0.15-0.22	1.6-5.8	0.5-1.0	.43	.49			
	12-19	2-55	48-80	15-35	1.30-1.60	0.6-2	0.15-0.22	1.6-5.8	0.2-0.8	.43	.49			
	19-23	---	---	---	---	---	---	---	---	---	---			
7050:														
Kennebec-----	0-8	2-8	65-75	22-30	1.25-1.35	0.6-2	0.22-0.24	3.0-6.0	5.0-6.0	.28	.28	5	6	48
	8-18	2-8	65-75	22-30	1.25-1.35	0.6-2	0.22-0.24	3.0-6.0	5.0-6.0	.28	.28			
	18-32	2-8	65-75	22-30	1.25-1.35	0.6-2	0.22-0.24	3.0-6.0	5.0-6.0	.28	.28			
	32-41	2-8	65-75	22-30	1.25-1.35	0.6-2	0.22-0.24	3.0-6.0	5.0-6.0	.28	.28			
	41-54	2-12	60-75	24-30	1.35-1.40	0.6-2	0.20-0.22	3.0-6.0	1.0-2.0	.43	.43			
	54-60	2-12	60-75	24-30	1.35-1.40	0.6-2	0.20-0.22	3.0-6.0	1.0-2.0	.43	.43			
7051:														
Kennebec, frequently flooded-----	0-8	2-8	65-75	22-30	1.25-1.35	0.6-2	0.22-0.24	3.0-4.7	5.0-6.0	.28	.28	5	6	48
	8-18	2-8	65-75	22-30	1.25-1.35	0.6-2	0.22-0.24	3.0-4.7	5.0-6.0	.28	.28			
	18-32	2-8	65-75	22-30	1.25-1.35	0.6-2	0.22-0.24	3.0-4.7	5.0-6.0	.28	.28			
	32-41	2-8	65-75	22-30	1.25-1.35	0.6-2	0.22-0.24	3.0-4.7	5.0-6.0	.28	.28			
	41-54	2-12	60-75	24-30	1.35-1.40	0.6-2	0.20-0.22	3.5-4.7	1.0-2.0	.43	.43			
	54-60	2-12	60-75	24-30	1.35-1.40	0.6-2	0.20-0.22	3.5-4.7	1.0-2.0	.43	.43			
7060:														
Muscotah-----	0-9	2-10	65-80	18-27	1.25-1.35	0.6-2	0.20-0.23	2.2-4.1	2.0-3.0	.37	.37	5	6	48
	9-16	2-10	60-80	18-30	1.25-1.35	0.6-2	0.20-0.23	3.0-5.9	0.2-0.8	.43	.43			
	16-30	2-8	40-70	27-40	1.30-1.40	0.2-0.6	0.21-0.23	3.0-5.9	2.0-4.0	.37	.37			
	30-39	2-8	40-70	35-50	1.20-1.30	0.06-0.2	0.11-0.20	6.0-8.9	2.0-4.0	.28	.28			
	39-61	2-8	40-70	35-50	1.20-1.30	0.06-0.2	0.11-0.20	6.0-8.9	2.0-3.0	.28	.28			
	61-70	2-8	40-70	35-50	1.20-1.30	0.0000-0.06	0.10-0.20	6.0-8.9	1.0-2.0	.28	.28			
	70-80	2-8	40-70	35-50	1.20-1.30	0.0000-0.06	0.10-0.20	6.0-8.9	0.8-2.0	.28	.28			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
7061:														
Muscotah-----	0-9	2-10	65-80	27-40	1.30-1.40	0.2-0.6	0.21-0.23	3.0-5.9	2.0-4.0	.37	.37	5	6	48
	9-16	2-8	40-70	27-40	1.30-1.40	0.2-0.6	0.21-0.23	3.0-5.9	2.0-4.0	.37	.37			
	16-23	2-8	40-70	27-40	1.30-1.40	0.2-0.6	0.21-0.23	3.0-5.9	2.0-4.0	.37	.37			
	23-35	2-8	40-70	35-50	1.20-1.30	0.06-0.2	0.11-0.20	6.0-8.9	2.0-4.0	.28	.28			
	35-44	2-8	40-70	35-50	1.20-1.30	0.06-0.2	0.11-0.20	6.0-8.9	2.0-4.0	.28	.28			
	44-60	2-8	40-70	35-50	1.20-1.30	0.06-0.2	0.11-0.20	6.0-8.9	2.0-3.0	.28	.28			
	60-70	2-8	40-70	35-50	1.20-1.30	0.0000-0.06	0.10-0.20	6.0-8.9	1.0-2.0	.28	.28			
	70-80	2-8	40-70	35-50	1.20-1.30	0.0000-0.06	0.10-0.20	6.0-8.9	0.8-2.0	.28	.28			
7091:														
Wabash-----	0-7	2-10	45-60	40-46	1.25-1.45	0.0015-0.06	0.12-0.14	7.9-9.4	2.0-4.0	.28	.28	5	4	86
	7-15	2-10	45-60	40-50	1.25-1.45	0.0015-0.06	0.12-0.14	7.9-10.4	2.0-4.0	.28	.28			
	15-80	2-10	30-55	40-60	1.20-1.45	0.0015-0.06	0.08-0.12	7.9-12.9	1.0-2.0	.28	.28			
7171:														
Reading-----	0-9	2-10	70-80	20-28	1.35-1.40	0.6-2	0.22-0.24	2.6-4.3	2.0-4.0	.32	.32	5	6	48
	9-18	2-10	70-80	20-28	1.35-1.40	0.6-2	0.22-0.24	2.6-4.3	2.0-4.0	.32	.32			
	18-48	2-8	60-70	27-35	1.40-1.50	0.2-2	0.18-0.20	4.1-5.8	0.5-3.0	.43	.43			
	48-54	2-8	60-70	27-35	1.40-1.50	0.2-2	0.18-0.20	4.1-5.8	0.5-2.0	.43	.43			
	54-80	2-22	40-65	25-35	1.40-1.50	0.2-2	0.13-0.20	3.7-5.8	0.1-0.5	.43	.43			
7205:														
Aksarben-----	0-9	2-8	50-70	27-35	1.35-1.55	0.6-2	0.17-0.23	4.6-6.7	2.0-4.0	.32	.32	5	7	38
	9-13	2-8	50-70	27-35	1.35-1.55	0.6-2	0.18-0.20	4.6-6.7	2.0-4.0	.32	.32			
	13-19	2-8	40-70	27-35	1.35-1.55	0.2-0.6	0.16-0.18	4.6-6.7	0.2-1.0	.43	.43			
	19-39	2-8	40-70	35-42	1.35-1.55	0.2-0.6	0.16-0.18	6.7-8.4	0.1-1.0	.43	.43			
	39-47	2-8	40-70	27-35	1.35-1.55	0.2-0.6	0.16-0.18	4.6-6.7	0.1-0.5	.43	.43			
	47-80	2-8	50-70	24-32	1.40-1.60	0.6-2	0.18-0.20	3.9-5.9	0.1-0.5	.43	.43			
7206:														
Aksarben-----	0-6	2-8	50-70	25-35	1.30-1.40	0.6-2	0.17-0.23	4.1-6.7	2.0-4.0	.32	.32	5	7	38
	6-12	2-8	50-70	25-35	1.30-1.40	0.6-2	0.17-0.23	4.1-6.7	1.5-3.0	.32	.32			
	12-42	2-8	40-70	35-42	1.20-1.45	0.2-0.6	0.16-0.18	6.7-8.4	0.8-2.0	.43	.43			
	42-60	2-8	50-70	27-35	1.30-1.40	0.6-2	0.18-0.20	4.6-6.7	0.5-1.5	.43	.43			
	60-80	2-8	50-80	24-32	1.30-1.40	0.6-2	0.18-0.20	4.1-5.9	0.2-0.8	.43	.43			
7207:														
Aksarben-----	0-6	2-8	50-70	25-35	1.30-1.40	0.6-2	0.17-0.23	4.1-6.7	2.0-4.0	.32	.32	5	7	38
	6-10	2-8	50-70	25-35	1.30-1.40	0.6-2	0.17-0.23	4.1-6.7	1.5-3.0	.32	.32			
	10-40	2-8	40-70	35-42	1.20-1.45	0.2-0.6	0.16-0.18	6.7-8.4	0.8-2.0	.43	.43			
	40-60	2-8	50-70	27-35	1.30-1.40	0.6-2	0.18-0.20	4.6-6.7	0.5-1.5	.43	.43			
	60-80	2-8	50-80	24-32	1.30-1.40	0.6-2	0.18-0.20	4.1-5.9	0.2-0.8	.43	.43			
7220:														
Burchard-----	0-9	20-45	25-60	20-30	1.15-1.40	0.2-0.6	0.17-0.19	2.6-4.7	2.0-4.0	.28	.28	5	6	48
	9-13	20-45	25-60	25-34	1.20-1.50	0.2-0.6	0.17-0.19	3.7-5.6	2.0-3.0	.28	.28			
	13-19	20-45	20-50	27-38	1.30-1.50	0.2-0.6	0.15-0.17	4.1-6.4	0.5-1.0	.37	.37			
	19-29	20-45	20-50	27-38	1.30-1.50	0.2-0.6	0.15-0.17	4.1-6.4	0.5-1.0	.37	.37			
	29-37	30-45	30-45	20-30	1.50-1.60	0.2-0.6	0.15-0.17	2.6-4.7	0.2-0.8	.37	.37			
	37-60	30-45	30-45	20-30	1.50-1.70	0.2-0.6	0.14-0.16	2.6-4.7	0.0-0.5	.37	.37			
7225:														
Burchard-----	0-9	20-45	25-60	20-30	1.15-1.40	0.2-0.6	0.17-0.19	2.6-4.7	2.0-4.0	.28	.28	5	6	48
	9-19	20-45	20-50	27-38	1.30-1.50	0.2-0.6	0.15-0.17	4.1-6.4	0.5-1.0	.37	.37			
	19-29	20-45	20-50	27-38	1.30-1.50	0.2-0.6	0.15-0.17	4.1-6.4	0.5-1.0	.37	.37			
	29-37	30-45	30-45	20-30	1.50-1.60	0.2-0.6	0.15-0.17	2.6-4.7	0.2-0.8	.37	.37			
	37-60	30-45	30-45	20-30	1.50-1.70	0.2-0.6	0.14-0.16	2.6-4.7	0.0-0.5	.37	.37			
Steinauer-----	0-6	20-45	30-50	25-35	1.20-1.35	0.2-0.6	0.19-0.22	3.7-5.8	0.5-2.0	.32	.32	5	4L	86
	6-14	20-45	30-50	27-35	1.30-1.50	0.2-0.6	0.17-0.19	4.1-5.8	0.5-1.0	.37	.37			
	14-80	20-45	30-50	18-35	1.30-1.65	0.2-0.6	0.16-0.19	2.2-5.8	0.1-0.5	.37	.37			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility group	erodi- bility index
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
7255: Grundy-----	0-7	2-8	70-85	24-38	1.35-1.50	0.6-2	0.22-0.24	3.9-7.4	2.0-4.0	.37	.37	5	6	48
	7-14	2-8	55-70	27-42	1.35-1.45	0.2-0.6	0.18-0.20	4.6-8.4	1.0-3.0	.37	.37			
	14-41	2-8	42-60	42-48	1.30-1.40	0.06-0.2	0.11-0.13	8.4-9.9	0.2-1.0	.37	.37			
	41-48	2-8	60-70	32-42	1.35-1.50	0.06-0.2	0.14-0.16	5.9-8.4	0.1-0.5	.37	.37			
	48-80	2-8	60-70	27-35	1.35-1.50	0.06-0.2	0.18-0.20	4.6-6.7	0.1-0.5	.37	.37			
7290: Marshall-----	0-10	2-8	65-75	25-30	1.25-1.30	0.6-2	0.21-0.23	3.7-4.7	3.0-4.0	.28	.28	5	6	48
	10-13	2-8	65-75	27-32	1.25-1.30	0.6-2	0.21-0.23	4.1-5.1	1.5-2.5	.28	.28			
	10-32	2-8	60-75	27-35	1.30-1.35	0.6-2	0.18-0.20	4.1-5.8	0.2-1.0	.43	.43			
	32-80	2-8	65-80	25-32	1.30-1.40	0.6-2	0.20-0.22	3.7-5.1	0.1-0.5	.43	.43			
7293: Marshall-----	0-10	2-8	65-75	25-30	1.25-1.30	0.6-2	0.21-0.23	3.7-4.7	3.0-4.0	.28	.28	5	7	38
	10-13	2-8	65-75	27-32	1.25-1.30	0.6-2	0.21-0.23	4.1-5.1	1.5-2.5	.28	.28			
	10-32	2-8	60-75	27-35	1.30-1.35	0.6-2	0.18-0.20	4.1-5.8	0.2-1.0	.43	.43			
	32-80	2-8	65-80	25-32	1.30-1.40	0.6-2	0.20-0.22	3.7-5.1	0.1-0.5	.43	.43			
7301: Martin-----	0-6	2-8	60-70	27-39	1.35-1.45	0.2-0.6	0.21-0.23	4.6-7.9	2.0-4.0	.37	.37	5	7	38
	6-12	2-8	55-70	27-39	1.35-1.45	0.2-0.6	0.18-0.20	4.6-7.9	1.0-2.0	.28	.28			
	12-53	2-8	38-60	40-55	1.20-1.30	0.06-0.2	0.12-0.18	7.9-12.0	0.5-2.0	.28	.28			
	53-80	2-8	38-65	35-45	1.20-1.30	0.06-0.2	0.12-0.18	6.7-9.2	0.1-0.8	.28	.28			
7303: Martin-----	0-6	2-8	60-70	27-40	1.35-1.45	0.2-0.6	0.21-0.23	4.6-7.9	2.0-4.0	.37	.37	5	7	38
	6-12	2-8	55-70	27-40	1.35-1.45	0.2-0.6	0.18-0.20	4.6-7.9	0.5-2.0	.28	.28			
	12-53	2-8	35-60	40-55	1.20-1.30	0.06-0.2	0.12-0.18	7.9-11.7	0.5-1.0	.28	.28			
	53-80	2-8	35-60	30-42	1.20-1.30	0.06-0.2	0.12-0.18	5.4-8.4	0.1-0.5	.28	.28			
7304: Martin-----	0-6	2-8	60-70	27-40	1.35-1.45	0.2-0.6	0.21-0.23	4.6-7.9	2.0-4.0	.37	.37	5	7	38
	6-14	2-8	60-70	27-40	1.35-1.45	0.2-0.6	0.21-0.23	4.6-7.9	2.0-3.5	.37	.37			
	14-24	2-8	55-70	27-40	1.35-1.45	0.2-0.6	0.18-0.20	4.6-7.9	0.5-2.0	.28	.28			
	24-53	2-8	35-60	40-55	1.20-1.30	0.06-0.2	0.12-0.18	7.9-11.7	0.5-1.0	.28	.28			
	53-80	2-8	35-60	30-42	1.20-1.30	0.06-0.2	0.12-0.18	5.4-8.4	0.1-0.5	.28	.28			
7415: Mayberry-----	0-10	15-40	25-45	27-40	1.40-1.50	0.2-0.6	0.17-0.23	4.6-7.9	1.0-3.0	.37	.37	5	6	48
	10-42	20-50	10-35	40-50	1.50-1.65	0.06-0.2	0.10-0.11	7.9-10.4	0.5-1.0	.37	.37			
	42-80	35-55	10-45	18-45	1.40-1.50	0.06-0.2	0.09-0.16	2.4-9.2	0.0-0.5	.37	.37			
7436: Morrill, eroded----	0-6	25-45	20-50	15-28	1.30-1.40	0.6-2	0.14-0.21	1.6-4.3	1.0-3.0	.28	.28	5	6	48
	6-12	25-45	20-40	22-32	1.30-1.40	0.6-2	0.14-0.21	3.0-5.1	1.0-2.0	.28	.28			
	12-22	25-60	15-35	22-35	1.35-1.45	0.2-0.6	0.15-0.19	3.0-5.8	0.5-1.0	.32	.32			
	22-43	25-60	15-35	22-35	1.35-1.45	0.2-0.6	0.15-0.19	3.0-5.8	0.5-1.0	.32	.32			
	43-80	40-90	10-35	3-30	1.35-1.45	0.6-6	0.08-0.15	0.2-4.7	0.1-0.8	.20	.20			
7455: Olmitz-----	0-7	25-45	30-50	20-27	1.40-1.45	0.6-2	0.19-0.21	2.6-4.1	3.0-4.0	.24	.24	5	6	48
	7-20	20-45	30-50	24-30	1.40-1.45	0.6-2	0.19-0.21	3.5-4.7	2.0-3.0	.28	.28			
	20-42	20-45	30-50	27-34	1.45-1.55	0.6-2	0.15-0.17	4.1-5.6	1.0-2.0	.28	.28			
	42-80	20-45	30-50	27-34	1.45-1.55	0.6-2	0.15-0.17	4.1-5.6	0.5-1.5	.28	.28			
7470: Padonia-----	0-11	2-10	50-70	27-35	1.30-1.40	0.6-2	0.21-0.23	4.1-5.9	2.0-4.0	.37	.37	3	7	38
	11-22	2-10	35-60	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.0-8.9	1.0-2.0	.32	.32			
	22-32	2-10	35-60	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.0-8.9	0.5-1.5	.32	.32			
	32-37	2-10	45-60	32-40	1.30-1.40	0.2-0.6	0.18-0.20	5.1-6.8	0.1-1.0	.43	.43			
	37-40	---	---	---	---	---	---	---	---	---	---			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind	Wind
										Kw	Kf	T	erodi- bility group	erodi- bility index
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
7470:														
Martin-----	0-6	2-8	60-70	27-39	1.35-1.45	0.2-0.6	0.21-0.23	4.6-7.9	2.0-4.0	.37	.37	5	7	38
	6-12	2-8	55-70	27-39	1.35-1.45	0.2-0.6	0.18-0.20	4.6-7.9	1.0-2.0	.28	.28			
	12-53	2-8	38-60	40-55	1.20-1.30	0.06-0.2	0.12-0.18	7.9-12.0	0.5-2.0	.28	.28			
	53-80	2-8	38-65	35-45	1.20-1.30	0.06-0.2	0.12-0.18	6.7-9.2	0.1-0.8	.28	.28			
7471:														
Padonia-----	0-11	2-10	50-70	27-35	1.30-1.40	0.6-2	0.21-0.23	4.1-5.9	2.0-4.0	.37	.37	3	7	38
	11-22	2-10	35-60	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.0-8.9	1.0-2.0	.32	.32			
	22-32	2-10	35-60	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.0-8.9	0.5-1.5	.32	.32			
	32-37	2-10	45-60	32-40	1.30-1.40	0.2-0.6	0.18-0.20	5.1-6.8	0.1-1.0	.43	.43			
	37-40	---	---	---	---	---	---	---	---	---	---			
Martin-----	0-6	2-8	60-70	27-39	1.35-1.45	0.2-0.6	0.21-0.23	4.6-7.9	2.0-4.0	.37	.37	5	7	38
	6-12	2-8	55-70	27-39	1.35-1.45	0.2-0.6	0.18-0.20	4.6-7.9	1.0-2.0	.28	.28			
	12-53	2-8	38-60	40-55	1.20-1.30	0.06-0.2	0.12-0.18	7.9-12.0	0.5-2.0	.28	.28			
	53-80	2-8	38-65	35-45	1.20-1.30	0.06-0.2	0.12-0.18	6.7-9.2	0.1-0.8	.28	.28			
7473:														
Padonia-----	0-11	2-10	50-70	27-35	1.30-1.40	0.6-2	0.21-0.23	4.1-5.9	2.0-4.0	.37	.37	3	7	38
	11-22	2-10	35-60	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.0-8.9	1.0-2.0	.32	.32			
	22-32	2-10	35-60	35-50	1.20-1.40	0.06-0.2	0.11-0.18	6.0-8.9	0.5-1.5	.32	.32			
	32-37	2-10	45-60	32-40	1.30-1.40	0.2-0.6	0.18-0.20	5.1-6.8	0.1-1.0	.43	.43			
	37-40	---	---	---	---	---	---	---	---	---	---			
Oska-----	0-5	2-8	50-70	27-40	1.30-1.40	0.2-0.6	0.18-0.20	4.6-7.9	1.0-3.0	.37	.37	2	7	38
	5-11	2-8	35-60	35-50	1.35-1.45	0.06-0.2	0.14-0.18	6.7-10.4	1.0-2.0	.37	.37			
	11-35	2-10	35-55	35-50	1.35-1.45	0.06-0.2	0.14-0.18	6.7-10.4	0.5-1.0	.37	.49			
	35-39	---	---	---	---	0.0000-0.0000	---	---	---	---	---			
7500:														
Pawnee-----	0-8	20-45	20-50	30-38	1.40-1.50	0.2-0.6	0.17-0.19	4.3-6.4	2.0-4.0	.37	.37	5	6	48
	8-15	20-45	20-50	30-42	1.40-1.50	0.2-0.6	0.17-0.19	4.3-7.2	1.0-3.0	.37	.37			
	15-41	15-40	15-40	40-50	1.50-1.70	0.06-0.2	0.09-0.11	6.0-8.9	0.5-2.0	.37	.37			
	41-51	15-40	15-40	35-45	1.50-1.70	0.06-0.2	0.09-0.11	6.0-7.9	0.5-1.5	.37	.37			
	51-60	20-55	20-50	25-38	1.40-1.50	0.06-0.2	0.14-0.16	3.7-6.4	0.1-0.5	.37	.37			
7502:														
Pawnee-----	0-7	20-45	20-50	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.4-7.4	2.0-4.0	.37	.37	5	6	48
	7-12	20-45	20-50	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.4-7.4	1.0-2.0	.37	.37			
	12-48	20-45	15-40	40-48	1.50-1.70	0.06-0.2	0.09-0.11	7.9-9.9	0.5-1.0	.37	.37			
	48-80	30-50	15-40	25-35	1.40-1.50	0.06-0.2	0.14-0.16	4.1-6.7	0.1-0.5	.37	.37			
7504:														
Pawnee-----	0-7	20-45	20-50	30-38	1.40-1.50	0.2-0.6	0.17-0.21	5.4-7.4	2.0-4.0	.37	.37	5	6	48
	7-12	20-45	20-50	30-38	1.40-1.50	0.2-0.6	0.17-0.19	5.4-7.4	1.0-2.0	.37	.37			
	12-48	20-45	15-40	40-48	1.50-1.70	0.06-0.2	0.09-0.11	7.9-9.9	0.5-1.5	.37	.37			
	48-80	30-50	15-40	25-40	1.40-1.50	0.06-0.2	0.14-0.16	4.1-7.9	0.1-0.5	.37	.37			
7510:														
Pawnee, eroded-----	0-6	20-45	20-50	35-42	1.40-1.50	0.2-0.6	0.17-0.19	4.3-7.2	1.5-3.0	.37	.37	5	4	86
	6-39	15-40	15-40	40-50	1.50-1.70	0.06-0.2	0.09-0.11	6.0-8.9	0.5-2.0	.37	.37			
	39-51	15-40	15-40	35-45	1.50-1.70	0.06-0.2	0.09-0.11	6.0-7.9	0.5-1.5	.37	.37			
	51-60	20-55	20-50	25-38	1.40-1.50	0.06-0.2	0.14-0.16	3.7-6.4	0.1-0.5	.37	.37			
7515:														
Pawnee, eroded-----	0-5	20-45	15-40	40-46	1.40-1.50	0.06-0.2	0.09-0.11	7.9-9.4	1.0-2.0	.37	.37	5	4	86
	5-45	20-45	15-40	40-48	1.50-1.70	0.06-0.2	0.09-0.11	7.9-9.9	0.5-1.0	.37	.37			
	45-80	30-50	15-40	25-35	1.40-1.50	0.06-0.2	0.14-0.16	4.1-6.7	0.1-0.5	.37	.37			

Table 19.--Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permea- bility (Ksat)	Available water capacity	Linear extensi- bility	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
										Kw	Kf	T		
	In	Pct	Pct	Pct	g/cc	In/hr	In/in	Pct	Pct					
7585: Shelby-----	0-13	20-45	20-45	20-32	1.50-1.55	0.2-0.6	0.17-0.19	2.6-5.1	2.0-4.0	.28	.28	5	6	48
	13-36	20-45	20-45	32-38	1.55-1.65	0.2-0.6	0.16-0.18	5.1-6.4	0.5-1.0	.37	.37			
	36-48	20-45	20-45	30-35	1.55-1.65	0.2-0.6	0.16-0.18	4.7-5.8	0.2-0.8	.37	.37			
	48-80	20-45	20-45	25-32	1.55-1.65	0.2-0.6	0.16-0.18	3.7-5.1	0.1-0.5	.37	.37			
7587: Shelby, eroded-----	0-8	20-45	20-45	27-32	1.50-1.55	0.2-0.6	0.16-0.18	4.1-5.1	1.5-3.5	.28	.28	5	6	48
	8-45	20-45	20-45	32-38	1.55-1.65	0.2-0.6	0.16-0.18	5.1-6.4	0.5-1.0	.37	.37			
	36-48	20-45	20-45	30-35	1.55-1.65	0.2-0.6	0.16-0.18	4.7-5.8	0.2-0.8	.37	.37			
	45-80	20-45	20-45	25-32	1.55-1.65	0.2-0.6	0.16-0.18	3.7-5.1	0.1-0.5	.37	.37			
7681: Wymore-----	0-8	1-3	50-70	26-38	1.25-1.45	0.2-0.6	0.21-0.24	4.4-7.4	2.0-4.0	.37	.37	5	7	38
	8-11	1-3	50-70	32-40	1.25-1.45	0.2-0.6	0.12-0.23	5.9-7.9	1.0-3.0	.37	.37			
	11-37	1-3	45-70	40-55	1.20-1.50	0.06-0.2	0.11-0.13	7.9-11.4	1.0-2.0	.28	.28			
	37-45	1-3	40-70	35-45	1.20-1.50	0.06-0.2	0.10-0.20	6.7-9.2	0.5-1.5	.43	.43			
	45-51	1-3	40-70	32-40	1.25-1.45	0.2-0.6	0.18-0.20	5.9-7.9	0.2-1.0	.43	.43			
	51-79	1-5	40-70	25-36	1.25-1.45	0.2-0.6	0.18-0.22	4.1-6.9	0.1-0.5	.43	.43			
7683: Wymore-----	0-7	2-8	50-70	27-40	1.30-1.50	0.2-0.6	0.21-0.23	4.6-7.9	2.0-4.0	.37	.37	5	7	38
	7-12	2-8	40-65	30-45	1.30-1.50	0.06-0.2	0.13-0.23	5.4-9.2	1.0-2.0	.37	.37			
	12-39	2-8	40-60	40-55	1.30-1.50	0.06-0.2	0.11-0.14	7.9-11.7	0.5-1.5	.32	.32			
	39-47	2-8	50-70	30-40	1.30-1.50	0.2-0.6	0.18-0.20	5.4-7.9	0.2-1.0	.43	.43			
	47-80	2-8	50-70	27-38	1.30-1.50	0.2-0.6	0.18-0.20	4.6-7.4	0.1-0.5	.43	.43			
7688: Wymore-----	0-6	1-3	45-70	32-43	1.25-1.45	0.06-0.6	0.12-0.23	5.9-8.7	1.5-3.5	.37	.37	5	7	38
	6-34	1-3	40-70	40-55	1.20-1.50	0.06-0.2	0.11-0.13	8.4-11.4	0.5-2.0	.32	.32			
	34-42	1-3	40-70	35-45	1.20-1.50	0.06-0.2	0.11-0.20	6.7-9.2	0.5-1.5	.32	.32			
	42-53	1-3	40-70	32-40	1.25-1.45	0.2-0.6	0.12-0.20	5.9-7.9	0.2-1.0	.43	.43			
	53-79	1-5	40-70	25-36	1.25-1.45	0.2-0.6	0.18-0.22	4.1-6.9	0.1-0.5	.43	.43			
Baileyville-----	0-6	1-2	45-70	32-45	1.25-1.45	0.06-0.2	0.12-0.23	5.4-9.2	1.0-3.5	.37	.37	5	7	38
	6-19	1-2	45-70	40-55	1.20-1.50	0.06-0.2	0.11-0.13	8.4-11.6	1.0-2.0	.28	.28			
	19-32	1-2	45-60	35-45	1.20-1.50	0.06-0.2	0.11-0.20	6.7-9.2	0.5-1.5	.32	.32			
	32-36	5-18	45-60	27-35	1.30-1.60	0.2-0.6	0.18-0.20	4.6-6.7	0.5-1.5	.43	.43			
	36-43	5-18	45-60	30-45	1.30-1.60	0.2-0.6	0.10-0.20	5.4-9.2	0.1-0.8	.43	.43			
	43-48	10-35	25-50	30-45	1.40-1.60	0.06-0.2	0.08-0.16	4.7-9.2	0.1-0.5	.32	.32			
	48-76	10-35	25-45	35-60	1.40-1.60	0.06-0.2	0.08-0.16	5.8-11.6	0.1-0.5	.32	.32			
7750: Nodaway-----	0-7	2-10	65-80	18-27	1.25-1.35	0.6-2	0.20-0.23	2.2-4.1	2.0-3.0	.37	.37	5	6	48
	7-14	2-15	60-80	18-30	1.25-1.35	0.6-2	0.20-0.23	2.2-4.7	0.1-0.5	.43	.43			
	14-45	2-20	60-80	18-30	1.25-1.35	0.6-2	0.20-0.23	2.2-4.7	0.1-0.5	.43	.43			
	45-60	2-20	60-80	18-30	1.25-1.35	0.6-2	0.20-0.23	2.2-4.7	0.1-0.5	.43	.43			
7851: Judson-----	0-7	2-8	65-80	24-27	1.30-1.35	0.6-2	0.21-0.23	3.5-4.1	4.0-5.0	.28	.28	5	6	48
	7-25	2-8	65-80	25-30	1.30-1.35	0.6-2	0.21-0.23	3.7-4.7	3.0-4.0	.28	.28			
	25-40	2-8	60-70	27-32	1.35-1.45	0.6-2	0.21-0.23	4.1-5.1	2.0-3.0	.43	.43			
	40-50	2-8	60-70	27-35	1.35-1.45	0.6-2	0.21-0.23	4.1-5.8	1.0-2.0	.43	.43			
	50-80	2-8	65-75	25-32	1.35-1.45	0.6-2	0.21-0.23	3.7-5.1	0.1-1.0	.43	.43			
7920: Contrary-----	0-6	2-8	60-80	27-35	1.30-1.40	0.6-2	0.18-0.20	4.1-5.8	0.5-2.0	.32	.32	5	7	38
	6-32	2-8	60-80	20-30	1.30-1.40	0.6-2	0.20-0.22	2.6-4.7	0.5-1.0	.43	.43			
	32-80	2-8	60-80	18-27	1.20-1.40	0.6-2	0.20-0.22	2.2-4.1	0.1-0.5	.43	.43			

[illegible]

Table 20.--Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
4350:							
Chase-----	0-9	23-36	5.6-7.3	0	0	0	0
	9-19	23-40	5.6-7.3	0	0	0	0
	19-41	23-48	5.6-7.8	0	0	0	0
	41-47	15-34	6.1-7.8	0-1	0	0	0
	47-80	15-31	6.1-8.4	0-1	0	0	0
4725:							
Kipson-----	0-8	20-29	6.6-8.4	10-20	0	0	0
	8-19	15-27	7.9-9.0	30-60	0	0	0
	19-22	---	---	---	---	---	---
Sogn-----	0-12	22-29	6.1-8.4	0-10	0	0	0
	12-16	---	---	---	---	---	---
4832:							
Wamego-----	0-9	22-27	5.6-6.5	0	0	0	0
	9-20	27-33	5.6-7.3	0	0	0	0
	20-25	27-32	5.6-7.3	0	0	0	0
	25-36	---	---	---	---	---	---
4834:							
Wamego-----	0-9	22-27	5.6-6.5	0	0	0	0
	9-20	27-33	5.6-7.3	0	0	0	0
	20-25	27-32	5.6-7.3	0	0	0	0
	25-36	---	---	---	---	---	---
Vinland-----	0-8	21-29	5.6-7.8	0	0	0	0
	8-12	12-27	5.6-7.8	0	0	0	0
	12-19	12-27	5.6-7.8	0	0	0	0
	19-23	---	---	---	---	---	---
7050:							
Kennebec-----	0-8	19-26	5.6-7.3	0	0	0	0
	8-18	19-26	5.6-7.3	0	0	0	0
	18-32	19-26	5.6-7.3	0	0	0	0
	32-41	19-26	5.6-7.3	0	0	0	0
	41-54	20-25	6.1-7.3	0	0	0	0
	54-60	20-25	6.1-7.3	0	0	0	0
7051:							
Kennebec, frequently flooded-----	0-8	19-26	5.6-7.3	0	0	0	0
	8-18	19-26	5.6-7.3	0	0	0	0
	18-32	19-26	5.6-7.3	0	0	0	0
	32-41	19-26	5.6-7.3	0	0	0	0
	41-54	20-25	6.1-7.3	0	0	0	0
	54-60	20-25	6.1-7.3	0	0	0	0
7060:							
Muscotah-----	0-9	20-25	6.1-7.3	0	0	0	0
	9-16	20-25	6.1-7.3	0	0	0	0
	16-30	15-30	5.6-7.3	0	0	0	0
	30-39	20-40	5.6-7.3	0	0	0	0
	39-61	20-40	5.6-7.3	0	0	0	0
	61-70	20-40	5.6-7.3	0	0	0	0
	70-80	20-40	5.6-7.3	0	0	0	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
7061:							
Muscotah-----	0-9	30-36	5.6-7.3	0	0	0	0
	9-16	15-30	5.6-7.3	0	0	0	0
	16-23	15-30	5.6-7.3	0	0	0	0
	23-35	20-40	5.6-7.3	0	0	0	0
	35-44	20-40	5.6-7.3	0	0	0	0
	44-60	20-40	5.6-7.3	0	0	0	0
	60-70	20-40	5.6-7.3	0	0	0	0
	70-80	20-40	5.6-7.3	0	0	0	0
7091:							
Wabash-----	0-7	32-46	5.1-7.3	0	0	0	0
	7-15	32-49	5.1-7.3	0	0	0	0
	15-80	26-46	5.1-7.3	0	0	0	0
7171:							
Reading-----	0-9	17-24	5.6-7.3	0	0	0	0
	9-18	17-24	5.6-7.3	0	0	0	0
	18-48	21-29	5.6-7.8	0	0	0	0
	48-54	21-28	5.6-7.8	0	0	0	0
	54-80	19-27	6.1-8.4	0	0	0	0
7205:							
Aksarben-----	0-9	23-36	5.1-6.5	0	0	0	0
	9-13	23-36	5.1-6.5	0	0	0	0
	13-19	8.5-23	5.1-6.5	0	0	0	0
	19-39	11-27	5.1-6.5	0	0	0	0
	39-47	8.5-18	5.6-6.5	0	0	0	0
	47-80	7.7-17	6.1-7.3	0	0	0	0
7206:							
Aksarben-----	0-6	21-36	5.1-6.5	0	0	0	0
	6-12	20-33	5.1-6.5	0	0	0	0
	12-42	21-34	5.1-6.5	0	0	0	0
	42-60	15-26	5.6-6.5	0	0	0	0
	60-80	10-19	6.1-7.3	0	0	0	0
7207:							
Aksarben-----	0-6	21-36	5.1-6.5	0	0	0	0
	6-10	20-33	5.1-6.5	0	0	0	0
	10-40	21-34	5.1-6.5	0	0	0	0
	40-60	15-26	5.6-6.5	0	0	0	0
	60-80	10-19	6.1-7.3	0	0	0	0
7220:							
Burchard-----	0-9	17-25	5.6-7.3	0	0	0	0
	9-13	21-28	6.1-7.3	0	0	0	0
	13-19	21-30	6.1-7.3	0	0	0	0
	19-29	21-30	7.4-8.4	5-10	0	0	0
	29-37	16-24	7.4-8.4	5-10	0	0	0
	37-60	14-23	7.4-8.4	10-15	0	0	0
7225:							
Burchard-----	0-9	17-25	5.6-7.3	0	0	0	0
	9-19	21-30	6.1-7.3	0	0	0	0
	19-29	21-30	7.4-8.4	5-10	0	0	0
	29-37	16-24	7.4-8.4	5-10	0	0	0
	37-60	14-23	7.4-8.4	10-15	0	0	0
Steinauer-----	0-6	20-28	7.4-8.4	1-10	0	0	0
	6-14	21-27	7.4-8.4	5-10	0	0	0
	14-80	14-27	7.4-8.4	10-15	0	0	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
7255:							
Grundy-----	0-7	21-39	5.6-7.3	0	0	0	0
	7-14	18-38	5.6-7.3	0	0	0	0
	14-41	17-30	5.1-7.3	0	0	0	0
	41-48	9.9-21	5.6-7.3	0	0	0	0
	48-80	8.5-18	6.1-7.3	0	0	0	0
7290:							
Marshall-----	0-10	21-25	5.6-7.3	0	0	0	0
	10-13	22-26	5.6-6.5	0	0	0	0
	10-32	21-27	5.6-6.5	0	0	0	0
	32-80	19-25	6.1-7.3	0	0	0	0
7293:							
Marshall-----	0-10	21-25	5.6-7.3	0	0	0	0
	10-13	22-26	5.6-6.5	0	0	0	0
	10-32	21-28	5.6-6.5	0	0	0	0
	32-80	18-25	6.1-7.3	0	0	0	0
7301:							
Martin-----	0-6	23-40	5.6-6.5	0	0	0	0
	6-12	18-32	5.6-7.3	0	0	0	0
	12-53	20-42	5.6-7.3	0	0	0	0
	53-80	11-26	5.6-7.8	0-1	0	0	0
7303:							
Martin-----	0-6	23-40	5.6-6.5	0	0	0	0
	6-12	15-32	5.6-7.3	0	0	0	0
	12-53	20-34	5.6-7.3	0	0	0	0
	53-80	9.4-21	5.6-7.8	0-1	0	0	0
7304:							
Martin-----	0-6	23-40	5.6-6.5	0	0	0	0
	6-14	23-39	5.6-6.5	0	0	0	0
	14-24	15-32	5.6-7.3	0	0	0	0
	24-53	20-34	5.6-7.3	0	0	0	0
	53-80	9.4-21	5.6-7.8	0-1	0	0	0
7415:							
Mayberry-----	0-10	18-37	5.6-6.5	0	0	0	0
	10-42	20-31	5.6-7.8	0	0	0	0
	42-80	3.4-23	6.1-8.4	0-5	0	0	0
7436:							
Morrill, eroded-----	0-6	13-23	5.1-7.3	0	0	0	0
	6-12	18-26	5.1-7.3	0	0	0	0
	12-22	18-27	5.1-7.3	0	0	0	0
	22-43	18-27	5.1-7.3	0	0	0	0
	43-80	2.7-24	5.1-7.3	0	0	0	0
7455:							
Olmitz-----	0-7	17-23	5.6-7.3	0	0	0	0
	7-20	20-25	5.6-7.3	0	0	0	0
	20-42	22-27	5.1-6.5	0	0	0	0
	42-80	21-27	5.1-7.3	0	0	0	0
7470:							
Padonia-----	0-11	22-29	6.1-7.3	0	0	0	0
	11-22	27-39	6.6-7.8	0	0	0	0
	22-32	27-38	7.4-8.4	1-10	0	0	0
	32-37	23-31	7.4-8.4	5-15	0	0	0
	37-40	---	---	---	---	---	---

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
7470:							
Martin-----	0-6	23-40	5.6-6.5	0	0	0	0
	6-12	18-32	5.6-7.3	0	0	0	0
	12-53	20-42	5.6-7.3	0	0	0	0
	53-80	11-26	5.6-7.8	0-1	0	0	0
7471:							
Padonia-----	0-11	22-29	6.1-7.3	0	0	0	0
	11-22	28-39	6.6-7.8	0	0	0	0
	22-32	27-38	7.4-8.4	1-10	0	0	0
	32-37	23-31	7.4-8.4	5-15	0	0	0
	37-40	---	---	---	---	---	---
Martin-----	0-6	23-40	5.6-6.5	0	0	0	0
	6-12	18-32	5.6-7.3	0	0	0	0
	12-53	20-42	5.6-7.3	0	0	0	0
	53-80	11-26	5.6-7.8	0-1	0	0	0
7473:							
Padonia-----	0-11	22-29	6.1-7.3	0	0	0	0
	11-22	28-39	6.6-7.8	0	0	0	0
	22-32	27-38	7.4-8.4	1-10	0	0	0
	32-37	23-31	7.4-8.4	5-15	0	0	0
	37-40	---	---	---	---	---	---
Oska-----	0-5	18-37	5.1-7.3	0	0	0	0
	5-11	23-39	5.1-7.3	0	0	0	0
	11-35	18-31	5.1-7.3	0	0	0	0
	35-39	---	---	---	---	---	---
7500:							
Pawnee-----	0-8	25-39	5.6-7.3	0	0	0	0
	8-15	20-38	5.6-7.3	0	0	0	0
	15-41	20-39	6.1-8.4	0	0	0	0
	41-51	18-32	6.1-8.4	0	0	0	0
	51-60	8.0-19	7.4-8.4	0-5	0	0	0
7502:							
Pawnee-----	0-7	25-39	5.6-7.3	0	0	0	0
	7-12	20-31	5.6-7.3	0	0	0	0
	12-48	20-30	6.1-8.4	0-5	0	0	0
	48-80	4.5-18	7.4-8.4	1-15	0	0	0
7504:							
Pawnee-----	0-7	25-39	5.6-7.3	0	0	0	0
	7-12	20-31	5.6-7.3	0	0	0	0
	12-48	20-34	6.1-8.4	0-5	0	0	0
	48-80	8.0-20	7.4-8.4	1-15	0	0	0
7510:							
Pawnee, eroded-----	0-6	26-38	5.6-7.3	0	0	0	0
	6-39	20-39	6.1-8.4	0	0	0	0
	39-51	18-32	6.1-8.4	0	0	0	0
	51-60	8.0-20	7.4-8.4	0-5	0	0	0
7515:							
Pawnee, eroded-----	0-5	26-36	5.6-7.3	0	0	0	0
	5-45	20-30	6.1-8.4	0-5	0	0	0
	45-80	4.5-18	7.4-8.4	1-15	0	0	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
7585: Shelby-----	0-13	17-27	5.1-7.3	0	0	0	0
	13-36	25-30	5.1-7.3	0	0	0	0
	36-48	22-27	5.1-7.3	0	0	0	0
	48-80	19-25	6.6-8.4	0-15	0	0	0
7587: Shelby, eroded-----	0-8	22-27	5.1-7.3	0	0	0	0
	8-45	25-30	5.1-7.3	0	0	0	0
	36-48	23-27	5.1-7.3	0	0	0	0
	45-80	19-25	6.6-8.4	0-15	0	0	0
7681: Wymore-----	0-8	22-39	5.6-6.5	0	0	0	0
	8-11	21-37	5.6-6.5	0	0	0	0
	11-37	26-42	5.6-6.8	0	0	0	0
	37-45	18-32	5.6-7.3	0-3	0	0	0
	45-51	13-26	6.6-7.3	0-3	0	0	0
	51-79	8.0-19	6.6-7.3	0-3	0	0	0
7683: Wymore-----	0-7	23-40	5.6-6.5	0	0	0	0
	7-12	20-36	5.6-6.5	0	0	0	0
	12-39	20-39	5.6-7.3	0	0	0	0
	39-47	13-26	6.6-7.3	0-2	0	0	0
	47-80	8.5-19	6.6-7.3	0-2	0	0	0
7688: Wymore-----	0-6	24-41	5.6-6.5	0	0	0	0
	6-34	21-42	5.6-6.5	0	0	0	0
	34-42	18-32	5.6-6.5	0-3	0	0	0
	42-53	13-26	6.6-7.3	0-3	0	0	0
	53-79	8.0-19	6.6-7.3	0-3	0	0	0
Baileyville-----	0-6	21-43	5.6-7.3	0	0	0	0
	6-19	26-42	5.6-6.5	0	0	0	0
	19-32	18-32	6.1-7.3	0-3	0	0	0
	32-36	15-26	6.1-7.3	0	0	0	0
	36-43	9.4-26	6.1-7.3	0	0	0	0
	43-48	9.4-23	6.1-7.8	0-7	0	0	0
	48-76	11-29	6.6-7.8	0-7	0	0	0
7750: Nodaway-----	0-7	16-23	6.1-7.3	0	0	0	0
	7-14	14-23	6.1-7.3	0	0	0	0
	14-45	14-23	6.1-7.3	0	0	0	0
	45-60	14-23	6.1-7.3	0	0	0	0
7851: Judson-----	0-7	21-23	5.6-7.3	0	0	0	0
	7-25	21-25	5.6-7.3	0	0	0	0
	25-40	22-26	5.6-7.3	0	0	0	0
	40-50	22-28	5.6-7.3	0	0	0	0
	50-80	19-25	6.1-7.8	0	0	0	0
7920: Contrary-----	0-6	21-28	5.6-7.3	0	0	0	0
	6-32	16-24	5.6-7.3	0	0	0	0
	32-80	14-21	6.1-7.8	0-5	0	0	0

Table 20.--Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	In	meq/100 g	pH	Pct	Pct	mmhos/cm	
7965:							
Monona-----	0-6	17-23	5.6-7.3	0	0	0	0
	6-11	17-23	6.1-7.3	0	0	0	0
	11-30	18-22	6.1-7.3	0	0	0	0
	30-80	14-19	6.6-8.4	0-10	0	0	0
7966:							
Monona, eroded-----	0-6	17-23	5.6-7.3	0	0	0	0
	6-30	18-22	6.1-7.3	0	0	0	0
	30-80	14-19	6.6-8.4	0-10	0	0	0
7981:							
Pohocco, eroded-----	0-5	16-25	6.6-7.8	0	0	0	0
	5-20	16-24	6.6-7.8	0	0	0	0
	20-39	16-22	7.4-7.8	0	0	0	0
	39-80	15-20	7.4-8.4	0-5	0	0	0
Netawaka-----	0-6	13-16	6.6-8.4	0-5	0	0	0
	6-9	10-15	7.4-8.4	5-10	0	0	0
	9-80	8.9-15	7.4-8.4	5-10	0	0	0
7982:							
Pohocco-----	0-5	16-25	6.6-7.8	0	0	0	0
	5-20	16-24	6.6-7.8	0	0	0	0
	20-39	16-22	7.4-7.8	0	0	0	0
	39-80	15-20	7.4-8.4	0-5	0	0	0
Netawaka-----	0-6	13-16	6.6-8.4	0-5	0	0	0
	6-9	10-15	7.4-8.4	5-10	0	0	0
	9-80	8.9-15	7.4-8.4	5-10	0	0	0
9971.							
Arents, earthen dam							
9983.							
Earthen pits and quarries							
9986.							
Miscellaneous water							
9999.							
Water							

Table 21.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Restrictive layer			Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Hardness		Uncoated steel	Concrete
		In				
4350: Chase-----	---	---	---	High	High	Low
4725: Kipson-----	Bedrock (paralithic)	7-20	Noncemented	Moderate	Low	Low
Sogn-----	Bedrock (lithic)	4-20	Indurated	Moderate	Low	Low
4832: Wamego-----	Bedrock (paralithic)	20-40	Noncemented	Moderate	Moderate	Moderate
4834: Wamego-----	Bedrock (paralithic)	20-40	Noncemented	Moderate	Moderate	Moderate
Vinland-----	Bedrock (paralithic)	10-20	Noncemented	Moderate	Low	Moderate
7050: Kennebec-----	---	---	---	High	Moderate	Low
7051: Kennebec, frequently flooded-----	---	---	---	High	Moderate	Low
7060: Muscotah-----	---	---	---	Moderate	High	Low
7061: Muscotah-----	---	---	---	Moderate	High	Low
7091: Wabash-----	---	---	---	High	High	Moderate
7171: Reading-----	---	---	---	High	Moderate	Low
7205: Aksarben-----	---	---	---	High	Moderate	Moderate
7206: Aksarben-----	---	---	---	High	Moderate	Moderate
7207: Aksarben-----	---	---	---	High	Moderate	Moderate
7220: Burchard-----	---	---	---	Moderate	Moderate	Low
7225: Burchard-----	---	---	---	Moderate	Moderate	Low
Steinauer-----	---	---	---	Moderate	Moderate	Low
7255: Grundy-----	---	---	---	High	High	Moderate

Table 21.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Hardness		Uncoated steel	Concrete
		In				
7290: Marshall-----	---	---	---	High	Moderate	Moderate
7293: Marshall-----	---	---	---	High	Moderate	Moderate
7301: Martin-----	---	---	---	High	High	Low
7303: Martin-----	---	---	---	High	High	Low
7304: Martin-----	---	---	---	High	High	Low
7415: Mayberry-----	---	---	---	High	High	Low
7436: Morrill, eroded-----	---	---	---	Moderate	Moderate	Moderate
7455: Olmitz-----	---	---	---	Moderate	Moderate	Moderate
7470: Padonia-----	Bedrock (paralithic)	20-40	Noncemented	Moderate	High	Low
Martin-----	---	---	---	High	High	Low
7471: Padonia-----	Bedrock (paralithic)	20-40	Noncemented	Moderate	High	Low
Martin-----	---	---	---	High	High	Low
7473: Padonia-----	Bedrock (paralithic)	20-40	Noncemented	Moderate	High	Low
Oska-----	Bedrock (lithic)	20-40	Indurated	Moderate	High	Moderate
7500: Pawnee-----	---	---	---	High	High	Low
7502: Pawnee-----	---	---	---	High	High	Low
7504: Pawnee-----	---	---	---	High	High	Low
7510: Pawnee, eroded-----	---	---	---	High	High	Low
7515: Pawnee, eroded-----	---	---	---	High	High	Low
7585: Shelby-----	---	---	---	Moderate	Moderate	Moderate
7587: Shelby, eroded-----	---	---	---	Moderate	Moderate	Moderate

Table 21.--Soil Features--Continued

Map symbol and soil name	Restrictive layer			Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Hardness		Uncoated steel	Concrete
		In				
7681: Wymore-----	---	---	---	High	High	Moderate
7683: Wymore-----	---	---	---	High	High	Moderate
7688: Wymore-----	---	---	---	High	High	Moderate
Baileyville-----	---	---	---	High	High	Moderate
7750: Nodaway-----	---	---	---	High	Moderate	Low
7851: Judson-----	---	---	---	High	Moderate	Low
7920: Contrary-----	---	---	---	High	Moderate	Moderate
7965: Monona-----	---	---	---	High	Low	Low
7966: Monona, eroded-----	---	---	---	High	Low	Low
7981: Pohocco, eroded-----	---	---	---	High	Moderate	Low
Netawaka-----	---	---	---	High	Low	Low
7982: Pohocco-----	---	---	---	High	Moderate	Low
Netawaka-----	---	---	---	High	Low	Low
9971. Arents, earthen dam						
9983. Gravel pits and quarries						
9986. Miscellaneous water						
9999. Water						

Table 22.--Water Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol and soil name	Hydro- logic group	Month	Soil saturation		Flooding	
			Upper limit	Lower limit	Duration	Frequency
			Ft	Ft		
4350: Chase-----	C	January	1.8-2.2	3.8-4.2	---	Rare
		February	1.8-2.2	3.8-4.2	---	Rare
		March	1.8-2.2	3.8-4.2	---	Rare
		April	1.8-2.2	3.8-4.2	---	Rare
		May	---	---	---	Rare
		June	---	---	---	Rare
		July	---	---	---	Rare
		August	---	---	---	Rare
		September	---	---	---	Rare
		October	---	---	---	Rare
		November	---	---	---	Rare
		December	---	---	---	Rare
4725: Kipson-----	D	Jan-Dec	---	---	---	None
Sogn-----	D	Jan-Dec	---	---	---	None
4832: Wamego-----	C	Jan-Dec	---	---	---	None
4834: Wamego-----	C	Jan-Dec	---	---	---	None
Vinland-----	D	Jan-Dec	---	---	---	None
7050: Kennebec-----	B	January	---	---	Very brief	Occasional
		February	3.3-3.7	>6.0	Very brief	Occasional
		March	3.3-3.7	>6.0	Very brief	Occasional
		April	3.3-3.7	>6.0	Very brief	Occasional
		May	---	---	Very brief	Occasional
		June	---	---	Very brief	Occasional
		July	---	---	Very brief	Occasional
		August	---	---	Very brief	Occasional
		September	---	---	Very brief	Occasional
		October	---	---	Very brief	Occasional
		November	3.3-4.6	>6.0	Very brief	Occasional
		December	---	---	Very brief	Occasional

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Soil saturation		Flooding	
			Upper limit	Lower limit	Duration	Frequency
			Ft	Ft		
7051: Kennebec, frequently flooded-----	B	January	---	---	Very brief	Frequent
		February	3.3-3.7	>6.0	Very brief	Frequent
		March	3.3-3.7	>6.0	Very brief	Frequent
		April	3.3-3.7	>6.0	Very brief	Frequent
		May	---	---	Very brief	Frequent
		June	---	---	Very brief	Frequent
		July	---	---	Very brief	Frequent
		August	---	---	Very brief	Frequent
		September	---	---	Very brief	Frequent
		October	---	---	Very brief	Frequent
		November	3.3-4.6	>6.0	Very brief	Frequent
		December	---	---	Very brief	Frequent
7060: Muscotah-----	D	January	1.8-2.2	>6.0	Very brief	Occasional
		February	1.8-2.2	>6.0	Very brief	Occasional
		March	1.8-2.2	>6.0	Very brief	Occasional
		April	1.8-2.2	>6.0	Very brief	Occasional
		May	2.8-3.2	>6.0	Very brief	Occasional
		June	---	---	Very brief	Occasional
		July	---	---	Very brief	Occasional
		August	---	---	Very brief	Occasional
		September	---	---	Very brief	Occasional
		October	---	---	Very brief	Occasional
		November	---	---	Very brief	Occasional
		December	2.8-3.2	>6.0	Very brief	Occasional
7061: Muscotah-----	D	January	1.8-2.2	>6.0	Very brief	Occasional
		February	1.8-2.2	>6.0	Very brief	Occasional
		March	1.8-2.2	>6.0	Very brief	Occasional
		April	1.8-2.2	>6.0	Very brief	Occasional
		May	2.8-3.2	>6.0	Very brief	Occasional
		June	---	---	Very brief	Occasional
		July	---	---	Very brief	Occasional
		August	---	---	Very brief	Occasional
		September	---	---	Very brief	Occasional
		October	---	---	Very brief	Occasional
		November	---	---	Very brief	Occasional
		December	2.8-3.2	>6.0	Very brief	Occasional
7091: Wabash-----	D	January	0.2-0.8	>6.0	Very brief	Occasional
		February	0.2-0.8	>6.0	Very brief	Occasional
		March	0.2-0.8	>6.0	Very brief	Occasional
		April	0.2-0.8	>6.0	Very brief	Occasional
		May	0.2-0.8	>6.0	Very brief	Occasional
		June	0.8-1.2	>6.0	Very brief	Occasional
		July	---	---	Very brief	Occasional
		August	---	---	Very brief	Occasional
		September	---	---	Very brief	Occasional
		October	---	---	Very brief	Occasional
		November	0.8-1.2	>6.0	Very brief	Occasional
		December	0.8-1.2	>6.0	Very brief	Occasional

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Soil saturation		Flooding	
			Upper limit	Lower limit	Duration	Frequency
			Ft	Ft		
7171: Reading-----	B	January	---	---	---	Rare
		February	---	---	---	Rare
		March	---	---	---	Rare
		April	---	---	---	Rare
		May	---	---	---	Rare
		June	---	---	---	Rare
		July	---	---	---	Rare
		August	---	---	---	Rare
		September	---	---	---	Rare
		October	---	---	---	Rare
		November	---	---	---	Rare
		December	---	---	---	Rare
7205: Aksarben-----	B	Jan-Dec	---	---	---	None
7206: Aksarben-----	B	Jan-Dec	---	---	---	None
7207: Aksarben-----	B	Jan-Dec	---	---	---	None
7220: Burchard-----	B	Jan-Dec	---	---	---	None
7225: Burchard-----	B	Jan-Dec	---	---	---	None
Steinauer-----	B	Jan-Dec	---	---	---	None
7255: Grundy-----	C	January	1.0-1.4	2.3-2.7	---	None
		February	1.0-1.4	2.3-2.7	---	None
		March	1.0-1.4	2.3-2.7	---	None
		April	1.0-1.4	2.3-2.7	---	None
7290: Marshall-----	B	Jan-Dec	---	---	---	None
7293: Marshall-----	B	Jan-Dec	---	---	---	None
7301: Martin-----	C	February	1.8-2.2	2.8-3.2	---	None
		March	1.8-2.2	2.8-3.2	---	None
		April	1.8-2.2	2.8-3.2	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Soil saturation		Flooding	
			Upper limit	Lower limit	Duration	Frequency
			Ft	Ft		
7303: Martin-----	C	February	1.8-2.2	2.8-3.2	---	None
		March	1.8-2.2	2.8-3.2	---	None
		April	1.8-2.2	2.8-3.2	---	None
7304: Martin-----	C	February	1.8-2.2	2.8-3.2	---	None
		March	1.8-2.2	2.8-3.2	---	None
		April	1.8-2.2	2.8-3.2	---	None
7415: Mayberry-----	D	February	0.8-1.2	2.8-3.2	---	None
		March	0.8-1.2	2.8-3.2	---	None
		April	0.8-1.2	2.8-3.2	---	None
7436: Morrill, eroded-----	B	Jan-Dec	---	---	---	None
7455: Olmitz-----	B	March	3.3-3.7	>6.0	---	None
		April	3.3-3.7	>6.0	---	None
7470: Padonia-----	C	Jan-Dec	---	---	---	None
Martin-----	C	February	1.8-2.2	2.8-3.2	---	None
		March	1.8-2.2	2.8-3.2	---	None
		April	1.8-2.2	2.8-3.2	---	None
7471: Padonia-----	C	Jan-Dec	---	---	---	None
Martin-----	C	February	1.8-2.2	2.8-3.2	---	None
		March	1.8-2.2	2.8-3.2	---	None
		April	1.8-2.2	2.8-3.2	---	None
7473: Padonia-----	C	Jan-Dec	---	---	---	None
Oska-----	C	Jan-Dec	---	---	---	None
7500: Pawnee-----	D	March	1.0-3.0	4.0-6.0	---	None
		April	1.0-3.0	4.0-6.0	---	None
		May	1.0-3.0	4.0-6.0	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Soil saturation		Flooding	
			Upper limit	Lower limit	Duration	Frequency
			Ft	Ft		
7502: Pawnee-----	D					
		February	1.0-1.4	2.8-3.2	---	None
		March	1.0-1.4	2.8-3.2	---	None
		April	1.0-1.4	2.8-3.2	---	None
7504: Pawnee-----	D					
		February	1.0-1.4	2.8-3.2	---	None
		March	1.0-1.4	2.8-3.2	---	None
		April	1.0-1.4	2.8-3.2	---	None
7510: Pawnee, eroded-----	D					
		March	1.0-3.0	4.0-6.0	---	None
		April	1.0-3.0	4.0-6.0	---	None
		May	1.0-3.0	4.0-6.0	---	None
7515: Pawnee, eroded-----	D					
		February	1.0-1.4	2.8-3.2	---	None
		March	1.0-1.4	2.8-3.2	---	None
		April	1.0-1.4	2.8-3.2	---	None
7585: Shelby-----	B					
		Jan-Dec	---	---	---	None
7587: Shelby, eroded-----	B					
		Jan-Dec	---	---	---	None
7681: Wymore-----	D					
		March	1.0-3.0	1.5-3.0	---	None
		April	1.0-3.0	1.5-3.0	---	None
7683: Wymore-----	D					
		February	1.0-1.4	2.8-3.2	---	None
		March	1.0-1.4	2.8-3.2	---	None
		April	1.0-1.4	2.8-3.2	---	None
7688: Wymore-----	D					
		March	1.0-3.0	1.5-3.0	---	None
		April	1.0-3.0	1.5-3.0	---	None
Baileyville-----	D					
		March	1.0-3.0	1.5-3.0	---	None
		April	1.0-3.0	1.5-3.0	---	None

Table 22.--Water Features--Continued

Map symbol and soil name	Hydro- logic group	Month	Soil saturation		Flooding	
			Upper limit	Lower limit	Duration	Frequency
			Ft	Ft		
7750: Nodaway-----	B	January	2.8-3.2	>6.0	Brief	Occasional
		February	2.8-3.2	>6.0	Brief	Occasional
		March	2.8-3.2	>6.0	Brief	Occasional
		April	2.8-3.2	>6.0	Brief	Occasional
		May	---	---	Brief	Occasional
		June	---	---	Brief	Occasional
		July	---	---	Brief	Occasional
		August	---	---	Brief	Occasional
		September	---	---	Brief	Occasional
		October	---	---	Brief	Occasional
		November	---	---	Brief	Occasional
		December	---	---	Brief	Occasional
7851: Judson-----	B	Jan-Dec	---	---	---	None
7920: Contrary-----	B	Jan-Dec	---	---	---	None
7965: Monona-----	B	Jan-Dec	---	---	---	None
7966: Monona, eroded-----	B	Jan-Dec	---	---	---	None
7981: Pohocco, eroded-----	B	Jan-Dec	---	---	---	None
Netawaka-----	B	Jan-Dec	---	---	---	None
7982: Pohocco-----	B	Jan-Dec	---	---	---	None
Netawaka-----	B	Jan-Dec	---	---	---	None
9971. Arents, earthen dam						
9983. Gravel pits and quarries						
9986. Miscellaneous water						
9999. Water						

Table 23.--Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series.)

Soil name	Family or higher taxonomic class
Aksarben-----	Fine, smectitic, mesic Typic Argiudolls
Baileyville-----	Fine, smectitic, mesic Oxyaquic Vertic Argiudolls
Burchard-----	Fine-loamy, mixed, superactive, mesic Typic Argiudolls
Chase-----	Fine, smectitic, mesic Aquertic Argiudolls
Contrary-----	Fine-silty, mixed, superactive, mesic Dystric Eutrudepts
Grundy-----	Fine, smectitic, mesic Aquertic Argiudolls
Haig-----	Fine, smectitic, mesic Vertic Argiaquolls
Judson-----	Fine-silty, mixed, superactive, mesic Cumulic Hapludolls
Kennebec-----	Fine-silty, mixed, superactive, mesic Cumulic Hapludolls
Kenridge-----	Fine-silty, mixed, superactive, mesic Cumulic Hapludolls
Kipson-----	Loamy, mixed, superactive, mesic, shallow Udorthentic Haplustolls
Marshall-----	Fine-silty, mixed, superactive, mesic Typic Hapludolls
Martin-----	Fine, smectitic, mesic Aquertic Argiudolls
Mayberry-----	Fine, smectitic, mesic Aquertic Argiudolls
Monona-----	Fine-silty, mixed, superactive, mesic Typic Hapludolls
Morrill-----	Fine-loamy, mixed, superactive, mesic Typic Argiudolls
Muscotah-----	Fine, smectitic, mesic Cumulic Hapludolls
Netawaka-----	Coarse-silty, mixed, superactive, calcareous, mesic Typic Udorthents
Nodaway-----	Fine-silty, mixed, superactive, nonacid, mesic Mollic Udifluvents
Olmitz-----	Fine-loamy, mixed, superactive, mesic Cumulic Hapludolls
Oska-----	Fine, smectitic, mesic Vertic Argiudolls
Otoe-----	Fine, smectitic, mesic Aquertic Hapludalfs
Padonia-----	Fine, mixed, superactive, mesic Typic Argiudolls
*Pawnee-----	Fine, smectitic, mesic Oxyaquic Vertic Argiudolls
Pohocco-----	Fine-silty, mixed, superactive, mesic Typic Eutrudepts
Reading-----	Fine-silty, mixed, superactive, mesic Pachic Argiudolls
Shelby-----	Fine-loamy, mixed, superactive, mesic Typic Argiudolls
Sogn-----	Loamy, mixed, superactive, mesic Lithic Haplustolls
Steinauer-----	Fine-loamy, mixed, superactive, calcareous, mesic Typic Udorthents
Vinland-----	Loamy, mixed, superactive, mesic, shallow Typic Hapludolls
Wabash-----	Fine, smectitic, mesic Cumulic Vertic Endoaquolls
Wamego-----	Fine, mixed, superactive, mesic Typic Argiudolls
Wymore-----	Fine, smectitic, mesic Aquertic Argiudolls
Zook-----	Fine, smectitic, mesic Cumulic Vertic Endoaquolls

NRCS Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at helpdesk@helpdesk.itc.nrcs.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map.